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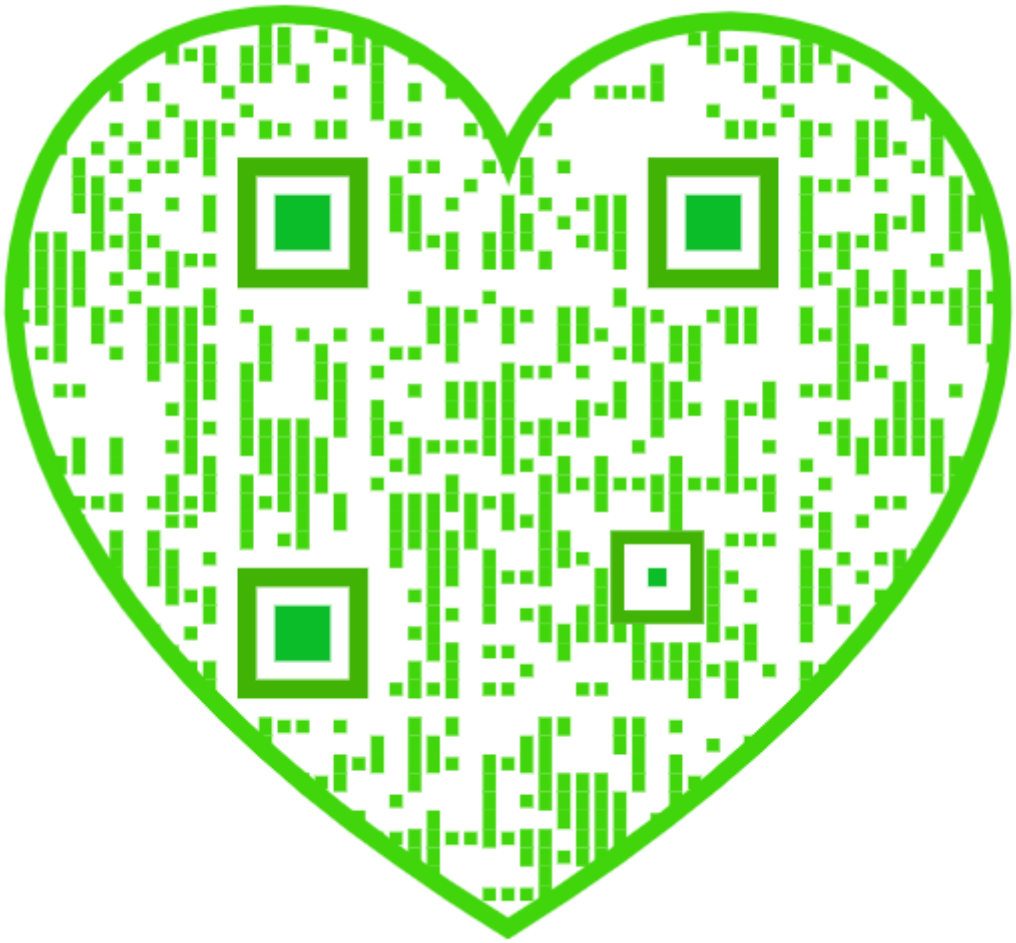

A

DICTIONARY

OF

PRACTICAL MEDICINE:

COMPRISING

GENERAL PATHOLOGY,

THE NATURE AND TREATMENT OF DISEASES, MORBID STRUCTURES,

AND THE DISORDERS ESPECIALLY INCIDENTAL TO CLIMATES, TO THE SEX, AND TO THE DIFFERENT EPOCHS OF LIFE;

WITH

NUMEROUS PRESCRIPTIONS FOR THE MEDICINES RECOMMENDED,

A CLASSIFICATION OF DISEASES ACCORDING TO PATHOLOGICAL PRINCIPLES, A COPIOUS BIBLIOGRAPHY, WITH REFERENCES;

AND AN

Appendix of Approved Formulae:

THE WHOLE FORMING A LIBRARY OF PATHOLOGY AND PRACTICAL MEDICINE, AND A DIGEST OF MEDICAL LITERATURE.

BY JAMES COPLAND, M.D.,

Consulting Physician to Queen Charlotte's Lying-in Hospital; Senior Physician to the Royal Infirmary for Diseases of Children; Member of the Royal College of Physicians, London; Member of the Medical and Chirurgical Societies of London and Berlin, etc.

EDITED, WITH ADDITIONS,

BY CHARLES A. LEE, M.D.

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cases, more especially in ardent fever and inflammations, and in some states of malignant fever, the skin is not only hot, but it also conveys the sensation of an acrid or burning heat, even above that which the actual rise of temperature should impart. In all inflammations and acute diseases, the heat of skin is increased, especially when the perspiratory functions are interrupted. The temperature of the skin is also greater than natural, when the blood is loaded with excrementitial elements, owing to diminished elimination by the kidneys, bowels, and skin, and more especially when the accumulation of these elements in the blood is attended by febrile or increased vascular action. It is also sometimes increased shortly before dissolution, probably owing to this state of the blood.

11. ii. *The colour of the skin* is variously changed in disease, and this change may be general, or in large patches, streaks, or in small spots or points. The change may consist either in absence of colour, or uncommon pallor, or in a deepening of the tint. All changes of colour arise from the quantity and quality of the blood circulating in the vessels of the cutis vera; or, in the opinion of Rokitansky, from the state of the epidermis, especially its inner, or Malpighian layer, from some change in its cells, or from some unusual pigment in them.

12. *A. Pallor* of the skin is owing either to excessive loss of blood, to exhausting maladies, or to the chronic deficiency of red globules observed in spontaneous anæmia, and some states of dropsy. The pallor may be associated with a slightly greenish or etiolated hue, as in chlorosis. It arises, in rare instances, from a congenital deficiency of pigment in the dark races, as observed in Albinoes, or from an acquired defect of this kind. This latter change—achroma—may occur in all races, is generally limited in extent, or consists of a number of spots, of various sizes, that gradually spread.

13. *B. Yellowishness* of the skin is one of the most common alterations of colour. The shade may be very pale or very deep, or the yellow may be mixed with green, and even a dark greenish hue may predominate. These shades of colour occur in the different states of jaundice, and are most frequently owing to biliary obstructions occasioned by disease of the liver, or gall-bladder, or of the gall-ducts. Various tints, varying from yellow to yellowish green, to a yellowish blue, seldom uniform in all places, or continuing of the same depth or shade, are observed in the courses of pestilential yellow fever, or hæmagastric fever, when the blood becomes much altered, and resemble the discolorations caused by contusions. This change occurs in large blotches, patches, streaks, &c., and is not limited to any one part of the body.

14. *C.* A *dark, sallow,* or *muddied aspect* of the skin is observed at an early stage of typhoid or adynamic fevers, and this appearance often increases as the disease advances. It is owing chiefly to the state of the blood produced by defective organization, or by imperfect depuration by the emunctories. A hue resembling this, but deeper, or inclining to brown, or to brownish yellow, seems to be owing to the deposit in the epidermis of a pigment. It occurs most frequently in spots, or in patches or streaks, very rarely over the whole surface. I have observed it in spots and patches in a lady, who many years previously was the subject of jaundice. The uniform embrowning of the skin, by exposure to the sun, the spotted stains or freckles—ephelis, and the liver-spots, connected with disorders of the biliary apparatus, or of the uterine functions, are modifications in the colouring matters retained by the epidermis. Rokitansky remarks, that the skin sometimes becomes dark, when, with neglect of it and indulgence in alcohol are combined infiltration of the liver with fat, and a tallowy state of the sub-cutaneous layer of fat. The skin in this case feels fatty, soft, and velvety, like that of a negro; its colour proceeds from the deposition of a pigment, containing fat, in the deepest layer of the epidermis—a fact of much interest, owing to the association it evinces.

15. *D. Redness* of the skin occurs in so diversified forms, and with so numerous shades of yellow, blue, brown, livid, copper, or bronze colour, &c., as to elude precise description, unless in affections and alterations of which these colours are pathognomonic. Of the several congestions, inflammations, impetiginous, exanthematous, chronic, and specific eruptions, these colours are severally characteristic. The redness passes into blue, or bluish yellow, even to black, after exudations of blood into the cutaneous tissue; as in the sugillations, ecchymosis, vibices, petechiæ, &c., of scurvy, purpura, maculated and malignant fevers.

16. *E. Blueness* of the skin is the characteristic of cyanosis, which is more or less general, although somewhat deeper in parts which are delicate and vascular, and in the extremities. When it is limited to particular parts, it is usually the result of congestion or of cold. A transient blueness of various parts of the surface has been remarked in rare instances by Otto; but in small patches or spots this discoloration is not infrequent. A *deep leaden* or bluish tint attends the collapse of pestilential cholera, but it is deeper on some parts than in others, especially shortly before dissolution. It also appears, in a slighter degree, in the face and extremities, in threatened asphyxia from congestive pneumonia, general bronchitis, hydrothorax, and from congestion of the lungs. A blue tint, approaching to bronze, is sometimes produced in the skin by the protracted use of nitrate of silver, and remains permanent, or nearly so, during life.

17. *F.* A *blackish tint* is sometimes observed in aged cachectic persons, especially in the lower limbs, and extends over large portions of the skin. It has been called melasma, and is different from melanosis. Lighter shades of black, passing into a tawny, dirty gray, leaden hue, &c., are sometimes observed in connexion with various acute and chronic diseases, characterized by extreme cachexia and dyscrasis of the blood and soft solids, especially pestilential and malignant maladies, scurvy, cancer, &c.

18. iii. *The texture of the skin* is often remarkably affected, and changes of texture are also attended and followed by alteration of colour.—*A. Anæmia* of the integuments is observed chiefly in universal anæmia, but it may affect the integuments of the extremities only. The skin is always pallid when anæmied; and the pallor presents a waxen hue when the skin is delicate, and the parts beneath are fat or œdematous.

19. *B. Congestion* of the skin is observed after death in the most depending parts. It is seen in some adynamic or malignant diseases, occasion-

ing lividity, dark-redness, or a bluish or blackish tint, and is most manifest in parts most remote from the heart, and when mechanical obstructions of the circulation exist.

20. *C. The exudations of blood*, or small, circumscribed hæmorrhages, into the tissues of the skin, forming small spots or larger patches, or sometimes streaks, observed in purpura, in scurvy, and in petechial fevers, have been ascribed by Rokitansky to a higher degree of congestion of the skin; but however greatly these changes may be owing to the cause to which he imputes it solely, they depend more on impaired irritability of the extreme capillaries, on diminished vital cohesion of the tissues composing the skin, and on dyscrasis and other changes in the blood itself. (*See art.* Hæmorrhage, § 14–19.)

21. *D. Inflammations* very frequently attack one or more of the tissues composing the skin. They are sometimes idiopathic and substantive diseases, especially when produced by external or physical causes; but they are more frequently symptomatic, or caused by morbid conditions of the circulating fluids, arising from a superabundance of excrementitial elements and materials in the blood, or from a specific animal miasm or poison. Most of the chronic eruptions or inflammations depend upon morbid states of the blood, caused by impaired depuration by the kidneys, liver, large bowels, or by the skin itself. Some of these inflammations may also appear as a morbid reflection on the skin of disordered actions of important internal viscera. Inflammations of the skin are either limited to spots or to patches, more or less numerous, or diffused over large tracts. They sometimes are seated only, or chiefly, in the external layer and papillæ, as in *erythema*; and at others, the deeper layer, and the whole thickness of the corium, are affected, as in *phlegmonous* inflammation. From these forms there are numerous transitions and associated changes, according as one or more of the layers or tissues composing the integuments, or as the subjacent cellular tissues, are implicated, and as the disease may extend in spots or patches, or become more or less diffused. Inflammations of the skin, whether erythematous, exanthematous, impetiginous, phlegmonous, furuncular, gangrenous or ulcerative, or acute, chronic or specific, have been so fully described in the numerous articles or heads to which they severally belong, that I cannot devote farther space to their special consideration, more particularly as there is nothing of importance which I can add to what has already been advanced respecting them individually.

22. *E. Adventitious growths* in the skin have been described chiefly in respect of their internal characters, and often commence in the subjacent cellular tissue. — *a. Molluscum simplex*, or soft, wart-like growths, attached by a pedicle, consists of saccular dilatations of the corium, and contains cellular tissue, and sometimes also fat.—*b. Fleshy excrescences*, which often form on the nose, are composed of a luxuriant growth, or hypertrophy, of the corium, and of cellular tissue.

23. *c. Condylomata* commonly form about the organs of generation and the arms, especially in the mucous membrane of the former. They are either soft, or more or less firm; and in their form they are either broad, or rounded, or pointed. They are often attached by a pedicle, their extremities resembling a mulberry, a cauliflower, or a cock's comb. They are composed of an investing layer of epithelium, and of newly-formed cellular tissue. They originate in the corium, where they take deep root. With these, Rokitansky believes that certain tumours regarded as syphiloid, the Radesyge, &c., may be connected.

24. *d. Fatty tumours* are most frequently congenital, but they are sometimes developed at later periods of life. One only may exist, or there may be several on different parts of the body. They are rounded, often truncated, and attached by a pedicle, and they sometimes reach a very considerable size. They consist of a prolongation of skin, as if protruded by an inclosed lobule of fat, which is continuous, by a sort of pedicle, with the sub-cutaneous, adipose stratum. The epidermis covering them is sometimes dark-coloured, owing to the pigment it contains, and hair occasionally grows upon them. When congenital, it is often associated with nævus in other parts of the skin.

25. *e. Fibrous tissue* occurs in the skin after repeated or chronic attacks of inflammation, and in the cicatrices after burns and other injuries. The alteration termed *cheloid* by Alibert is connected with the fibrous; for it appears to consist of a fibrous callus, and with that appearance its external cicatrix-like aspect corresponds. Rokitansky describes this latter alteration—the cheloid — as consisting of several varieties — of a simple hardness or callosity of the skin; or of a flat, somewhat raised, or a depressed hardness; or of a cord-like hardness, and of a white, or pale, or rose colour. In either form, it may terminate in white or red elevated lines or processes. It is of inconsiderable extent, and occurs, for the most part singly, at the upper part of the trunk, on the extremities, or on the face. It rarely exists in large numbers, and it seldom ulcerates; when it does so, it becomes indolent and difficult to heal. It is generally connected with constitutional disorder, but it is not truly cancerous.

26. *f. Bony deposits* are extremely rare in the skin. Rokitansky once found a bony plate, which was oval, yellowish, hard, and rugged, of the size of a half crown, in the substance of a scar on the trunk. It corresponded precisely with the osseous deposits occurring in fibrous exudations on serous membranes.

27. *g. Vascular nævi — teleangiectasis —* are generally congenital. They sometimes form deep or bluish red stains, of various sizes and shapes; occasionally red tumours, resembling cherries, strawberries, or mulberries, and often present a transient swelling—*erectile* or *splenoid tumours* of some authors. They also commence, in rare instances, after birth, or at later periods, and are at first, or even subsequently, not malignant; but they may, in the cancerous diathesis, be converted into malignant growths—into a fungus hæmatodes cutis.

28. *h. Melasma*, or the blackish discolorations observed chiefly in aged, decrepit, and cachectic persons, occurs either diffused in parts of the surface of the body, especially the lower extremities, rarely over the whole surface, or concentrated in small raised spots, or berry-like tumours, on the trunk or face. In the former, the colouring matter is diffused on the surface of the cutis; in the latter, in the substance of the cutis also. Melasma should not be confounded with melanosis, the cancer melanodes.

29. *i. Tubercle.*—It is doubtful whether or no true tuberculosis affects the skin in a way corre-

sponding to that observed in mucous, serous, and parenchymatous structures. Tubercles, however, appear in ulcers affecting the cutaneous expansions of scrofulous persons, but most frequently in a softened form, or in that of puriform tubercular matter. An ulcerative softening of the skin, in connexion with tubercular deposits in the sub-cutaneous cellular tissue or in lymphatic glands, is a common occurrence.

30. *k.* Cysts do not occur in the cutis vera; but the sebaceous glands often degenerate into cysts of considerable size. Cysts also form in the sub-cutaneous cellular tissue, and become closely connected with the skin. These, as well as morbidly-enlarged sebaceous follicles, commonly contain cholesterine. This substance has also been met with as a stratum on the surface of open ulcers of the skin.

31. *l. Cancer* and cancerous ulceration are often met with on the skin. When cancer commences in the sub-cutaneous or glandular tissues, particularly the mammæ and lymphatic glands, it generally soon implicates the skin, and becomes, from an early period, very closely connected with the cutis. But cancer often also originates in the skin, in the form either of fibrous or scirrhous cancer, or of medullary cancer.

32. (*a*) *Fibrous cancer* of the skin generally assumes the form of a tuberculated or rounded nodule, sometimes flattened, or even depressed, below the surface of the skin, and forming an umbilicated fossa. It is generally single, about the size of a hempseed, pea, or small nut, firmly fixed, and as hard as cartilage. Sometimes it is smooth and shining externally, occasionally covered by a hard, laminated crust of cuticle, and often darker than the surface around. It occurs chiefly on the face, lips, and nose, but occasionally on other parts of the body. It is commonly the primary cancerous growth, and often the first of a series of cancerous formations in different organs. In some instances it reaches a considerable size, growing into a tuberous mass, projecting beyond the skin. (Rokitansky.)

[This form of cancer is called "superficial epithelial" by Paget. The condylomatous appearance which it assumes is owing to enlargement of the papillæ of the skin or mucous membrane. It is this character which often leads to mistaking them for common warty growths. For a very lucid account of the different forms of epithelial cancer, see American edition of "*Lectures on Surgical Pathology*," by James Paget, Philadelphia, 1854.]

33. (*b*) The *medullary kind* is usually a secondary formation, and consequent upon large cancerous growths, which first appear just beneath the skin, or which involve the sub-cutaneous structure first, and then the skin itself. In either case it grows in the skin in isolated or confluent nodules, near the primary mass. It sometimes also appears in the skin after it has been localized in one or more organs. The nodules which it forms in the cutis are mostly numerous, and about the size of peas or hazel-nuts; they are scattered over the body, especially over the trunk, and generally near similar growths in the sub-cutaneous cellular tissue. In the case of a boy, about 14 years of age, for whom I was consulted, I counted upward of twenty thus disseminated. It is characterized as a whitish or whitish red growth, which is sometimes tolerably firm and lardaceous, or medullary, and occasionally looser, softer, and resembling cerebral substance, or even much softer and diffluent, and it often grows to a considerable size. It may also contain black pigment, and thus constitute *cancer melanodes* of the skin. The layer of skin above the nodule becomes stretched, and shining or transparent, or rough from the loss of its epidermis. Sometimes the elementary particles of the disease are deposited in vascular *nævi*, or, as the deposition takes place, the vessels of the part are excessively developed, and a cancerous structure, of uncommon vascularity, is the result, or *fungus hæmatodes* of the skin. Rokitansky considers *chimney-sweepers' cancer* and Alibert's *eburnated cancer of the skin* as special varieties of this disease.

34. *α. Chimney-sweepers' cancer* appears to be medullary. It begins in the scrotum as a tolerably firm, small nodule, or warty excrescence, which after some time becomes red, excoriated, moist, and covered by a cortex of thickened cuticle. The papillæ beneath enlarge, and the whole becomes an ulcer, with irregular, hard, and raised edges. Fresh nodules form around the original one, undergo the same changes, and enlarge the disease superficially. The nodules are developed into fungous cauliflower excrescences, and the disease extends deeply, until the dartos, the tunica vaginalis, and testicle are successively implicated, and the gland itself ulcerates, while the adjoining lymphatic glands and vas deferens degenerate up to the abdominal cavity.*

35. *β. Eburnated cutaneous cancer* is a secondary degeneration of the cutis over a sub-cutaneous scirrhous mass. The skin is white, glistening, indurated, partially transparent, and immovable, over the firm or hard mass. This change of the skin evidently belongs to the fibrous form of cancer, as it is always connected with the subjacent scirrhus. *Cancerous ulceration* supervenes, at a sooner or later period, upon all the forms of cutaneous cancer, and generally proceeds as I have described when treating of Cancer. (*See that art.*, § 11, *et seq.*)

36. *m. Parasites.*—Several kinds of *pediculi* are found on the skin, especially on parts covered by hair; and the *acarus scabiei*, and probably other species of the genus acarus, occur on, and in eruptions of, the skin. Various fungi also exist in certain chronic eruptions on the cutis, as in cases of *tinea favosa* and *sycosis*. The sub-cutaneous cellular tissue not infrequently lodges the *filiaria medinensis*, especially in certain climates, as the western coast of Africa, &c.

37. III. The Sebaceous Glands or follicles and their ducts are often the seats of various disorders; and in many of the affections of the skin, and in some of the exanthemata, especially small-pox and measles, they are especially implicated. But they are more manifestly the seat of disorder when an accumulation of thin secretion takes place in them, owing to an impaired power of discharging it, or of throwing it off, or to obstruction of their ducts. In the former state, or impaired power of excretion, the duct is enlarged, and fill-

* [Small, scaly, or incrusted warts are very common in chimney-sweeps, and the whole skin is apt to be dry, harsh, and dusky. They are not confined to the scrotum, but may exist on every part of the trunk and limbs. Why *soot* should produce such a condition of skin as to lead to epithelial cancer in persons of a cancerous diathesis (for it is inoperative in others), it were in vain to seek. Charcoal dust and other powdery substances produce no such effect, so far as we have observed.]

ed with the accumulated secretion, forming what has been termed *maggots*. In the latter state, the secretion accumulates in the follicular sac itself, and produces a rounded tumour, from the size of a millet seed to that of a hazel-nut, or even larger. The matter thus accumulated consists of a whitish substance, of a pulpy consistence, viscid like fat, and resembling adipocire. In many cases it is very offensive in its odour, and irritating to the containing tissues, thereby producing inflammation, as in acne, syoosis, &c. Calcareous deposits, and even horny excrescences, may even originate in those glands in very rare instances. The secretions of the sebaceous follicles may be either deficient in quantity, altered in quality, or excessive in amount, and in either case occasion a more or less manifest disorder of the functions of the skin. In the *first* of these conditions, the skin will be dry and harsh; in the *second*, the exhalation from it will be more or less offensive; and in the *third*, it will be unctuous, humid, and often also offensive to the smell.

38. IV. The Cuticle and Nails partake in several of the diseases of the skin.—(*a*) The *cuticle* is sometimes very thin and delicate throughout, owing to original formation, but more frequently only in parts, especially in those where it has been recently thrown off. It is much more frequently formed in excess; and then either its outer layers are separated in the form of bran, scales, scurf, or laminæ, or it accumulates and adheres, producing callosities, corns, or crusts, of various forms and sizes, occasioning more or less uneasiness, or pains of the subjacent parts.

39. *a*. The *colour* of the skin partly resides in the deeper layers of the cuticle, which may contain a yellowish, brownish, or a black pigment, distinguishing, when congenital and general, particular races or individuals. But the colouring may be acquired, and limited to particular spots or parts, or be more or less diffused, and indicate disorders of important internal organs, or a cachectic condition of the whole economy. It is always in excess, in a remarkable degree, in congenital nævi. A complete absence of the colouring matter is congenital in albinoismus, and is acquired in achroma or vitiligo. The former may be general or partial; the latter is always partial at first, but it may become more general.

40. *β*. The epidermis is often drier and harsher than natural; it is rarely more moist. It presents the former states in various cutaneous diseases, in which it is either thrown off in the form of scales, or it accumulates, and occasions cracks or fissures, extending through it into the cutis. Accumulation of the epidermis, or of the cells composing this structure, is often simultaneous with, if not the consequence of, excessive development of the papillæ of the cutis. The morbid results of these conditions are one or other of the following: 1st. *Callosity*, tyloma, or simple accumulation of epidermoid cells, in the form of strata, successively formed underneath, the more recently produced extruding the older; 2d. *Corn*, or clavus, a circumscribed callus, projecting into the corium, and occasioning more or less pain; 3d. *Crusts*, scutes, or scutiform accumulations of laminæ of diseased epidermis, presented by the scaly eruptions; 4th. *Horny growths* proceed either from a diseased portion of skin, or from a sebaceous follicle, and are met with generally on the scalp, and are usually single; much more rarely two or more are observed. They are of various dimensions, from half an inch to several inches in length, and as thick as, or thicker than a finger; straight, or curved, or crooked; attached by a broad base, and of a dark colour. They have been observed in some cases to be regularly shed at intervals; and when removed, they are reproduced, if the portion of skin producing them be not destroyed.

41. (*b*) The *nails* often present the peculiarities possessed by the parents, or evince hereditary characters. Their growth may be excessive or deficient, or they may be misshapen or thick, twisted, or curved; they may be everted or inverted; or become excessive in length, or much shortened. Eversion is often observed in psoriasis, when shortening, thickening, and induration are often coexistent with it. The nails are then discoloured, and are also drier and more brittle than natural. Incurvation of the nails, sometimes with elongation, is common in tubercular consumption. The most deformed states of the nails are observed in connexion with the scaly eruptions. (See the articles on these eruptions and that on the Hair.)

42. V. Classification of the Diseases of, or affecting the Skin.—The arrangement of diseases of the skin must necessarily be conventional. All disorders of the animal economy—whether functional or structural, whether local or constitutional, whether internal or external—glide insensibly into those more intimately allied to them in situation, in the nature of the tissues affected, in constitutional disturbance, and in the local and general characters of the affection, and present no constant lines of demarcation by which they can be accurately separated from those which they most resemble. Morbid actions, even in their most visible and palpable forms, evince none of the unalterable features characterizing the products of the vegetable and animal kingdoms. These products belong to distinct genera and species, and each consists of a specific being; but morbid actions are incalculably diversified and ever varying, passing insensibly, and more or less rapidly, into as varying states of visible disease, and ultimately into not merely manifest but also palpable organic changes, when the earlier phases or grades of morbid action are not arrested by vital resistance, or by the aid of medicine.

43. Of the more or less *artificial classifications* of diseases of the skin, furnished by Plenck, Willan, Bateman, Plumbe, Rayer, Wilson, and others; or of the *natural arrangements* attempted by Alibert and Paget, most of the former being modifications of the classification of Plenck or Willan, it is unnecessary to take particular notice. An artificial arrangement involves frequent repetition when treating of this class of diseases—presents as unvarying distinctions what are continually undergoing changes, and are neither peculiar nor constant—and insufficiently recognises constitutional disturbances, specific taints, and contaminating causes. Natural classifications, while they are based on natural alliances arising out of constitutional conditions, and specific causes or contaminating influences, retain those visible or palpable distinctions which actually exist, and present them for the purposes of diagnosis and of rational treatment. The artificial plan comprises, under the same order, eruptions which require the most opposite indications and means of cure; while the natural arrangement associates those maladies in one

family or order, for which the same indications and remedies are found most beneficial. Without entirely neglecting the classifications of Alibert and Paget, the following has been devised with a much stricter adhesion to constitutional and natural alliances than these writers have shown, and with a due recognition of the causes, contaminating characters, and ultimate changes which distinguish these diseases individually, and which connect each group and family with those preceding or following it. The reader will perceive, by comparing the following arrangement with those of the authors above mentioned, in what it differs, as well as in what it agrees with them.

44. Order, Family, or Natural Group I. Dyschromata—*Maculæ*.—Changes of colour, or excess or deficiency of the colouring matter of the skin, occurring congenitally, or at any period of life, generally in spots or large patches, and frequently connected with slight disorder of the digestive organs or of the general health.

45. Genus i.—Pannus—Ephelis—*Chloasma*.—Consisting of spots, patches, &c., of various forms, of a darker or deeper hue of the skin, owing to increase of its colouring matter, occurring at any period of life.—*Spec.:* 1st. *P. lenticularis;* 2d. *P. hepaticus;* 3d. *P. melaneus;* 4th. *P. carateus.* (*See art.* Ephelis.)

46. Genus ii.—Achroma.—White spots or patches scattered over the skin, or limited to a part, the discoloration being remarkable, and often attended by temporarily impaired sensibility, owing to deficient or interrupted arterial circulation, when the extremities are its seat.—*Spec.:* 1st. *A. Vitiligo;* 2d. *A. Congeniale.*

47. Order II. Dermatites—D. simplices—Eczemata—*Eczematosæ*.—Inflammations of the skin, attended by redness, itching, stinging, slight swelling, or an eruption of papulæ, vesicles, bullæ, pustules, or tubercles; often being of local origin, but much more frequently depending upon disorder of the digestive and eliminating organs, and consecutively of the circulating fluids, and observing either an acute, or sub-acute, or chronic course. They are not limited to any part of the cutaneous expansions; they may affect one or more of the cutaneous tissues, or even extend, more or less, to the subjacent cellular substance; and they are not contagious.

48. Genus i.—Erythema.—Superficial redness, varying in extent, with slight elevation, terminating in furfuration and desquamation, or, in cachectic habits, from neglect of cleanliness, or improper treatment, in excoriation or ulceration.—*Spec.:* 1st. *E. spontaneum;* 2d. *E. endemicum;* 3d. *E. epidemicum;* 4th. *E. Intertrigo;* 5th. *E. Paratrimma;* 6th. *E. Pernio;* 7th. *E. per Adustionem.* (*See art.* Erythema.)

49. Genus ii.—Roseola—*Rose-rash*.—Rose-coloured, irregular, and slightly-elevated patches of the skin, transient and not papular; passing into deeper roseate hues as they disappear, generally preceded or attended by slight fever, or gastro-intestinal disorder.—*Spec.:* 1st. *R. æstiva;* 2d. *R. autumnalis;* 3d. *R. annulata;* 4th. *R. infantilis;* 5th. *R. symptomatica vel associata*—of small-pox, of cow-pox, of fever; of gout, of the consecutive fever of pestilential cholera. (*See art.* Rose-rash.)

50. Genus iii.—Urticaria.—An eruption of regular, prominent patches or wheals, of various sizes, generally transient, and attended by burning, tingling, and itching, and by slight fever and disorder of the digestive functions.—*Spec.:* 1st. *U. febrilis;* 2d. *U. evanida;* 3d. *U. tuberosa.*

51. Genus iv.—Lichen—*Lacheniasis*.—An eruption of clustered or irregularly disseminated papulæ, attended by itching, stinging, &c., and slight febrile disturbance, or gastro-intestinal disorder, terminating in desquamation, and liable to recur.—*Spec.:* 1st. *L. simplex;* 2d. *L. Strophulus;* 3d. *L. agrius, vel L. tropicus.* (*See art.* Lichen.)

52. Genus v—Prurigo.—A papular eruption, the papulæ being larger than those of lichen, of nearly the colour of the skin, generally appearing on the outer surface of the limb, attended by burning and intolerable itching, &c.—*Spec.:* 1st, *P. mitis;* 2d. *P. formicans;* 3d. *P. senilis.* (*See art.* Prurigo.)

53. Genus vi.—Eczema.—An eruption of minute vesicles, crowded together, non-contagious, and terminating by the absorption or evaporation of a thin fluid, or by excoriations, with serous exudations, concreting into crusts.—*Spec.:* 1st. *E. simplex;* 2d. *E. rubrum;* 3d. *E. impetiginodes;* 4th. *E. mercuriale.* (*See* Eczema.)

54. Genus vii.—Herpes.—An eruption of vesicles, distinctly but irregularly clustered, upon inflamed bases, extending beyond the margins of the clusters, attended by tingling, concreting into lamellar scabs.—*Spec.:* 1st. *H. phlyctenodes;* 2d. *H. circinnatus;* 3d. *H. Zoster;* 4th. *H. præputialis;* 5th. *H. Iris.* (*See art.* Herpetic Eruptions.)

55. Genus viii.—Bullæ.—An elevation of the epidermis by an effusion of serum, often passing into a sero-puriform fluid, into large vesicles or blebs, which are generally round or oval, have a broad base, and vary in size from that of a pea to that of an egg.—*Spec.:* 1st. *Pemphigus;* 2d. *Rupia.* (*See arts.* Bullæ, Pemphigus, and Rupia.)

56. Genus ix.—Ecthyma.—An eruption of phlyzaceous pustules, always distinct, seated on a hard, inflamed base, and followed by dark scabs, leaving slight cicatrices or red stains, which disappear after some time.—*Spec.:* 1st. *E. acutum, vel E. vulgare;* 2d. *E. chronicum, vel E. cachecticum.* (*See art.* Ecthyma.)

57. Genus x.—Impetigo—*Mellitagra*.—The eruption of psydraceous pustules, commonly grouped in clusters, sometimes distinct, and forming yellowish, rough incrustations; attended by itching, but by little or no fever.—*Spec.:* 1st. *I. simplex;* 2d. *I. favosa, vel Porrigo favosa;* 3d. *I. eczematosa;* 4th. *I. rodens.* (*See art.* Impetiginous Affections.)

58. Genus xi.—Acne—*Varus—Adenodermatitis*.—A pustular affection, appearing chiefly about the period of puberty in both sexes, occurring as small, isolated pustules, with hard, deep-red bases, leaving circumscribed, indolent, and hard tumours, and seated chiefly in the sebaceous follicles, most frequently of the face, neck, shoulders, and breast.—*Spec.:* 1st. *A. simplex;* 2d. *A. indurata;* 3d. *A. rosacea.* (*See art.* Acne.)

59. Genus xii.—Furunculus.—Inflammation limited superficially, but extending to all the cutaneous tissues and subjacent cellular substance, forming a hard, conical tumour of a dull red colour, varying from the size of a pea to that of a pigeon's egg, terminating in suppuration, with the evacuation of a membranous slough, or of the membrane that enclosed the matter.—*Spec.:* 1st.

F. vulgaris; 2d. *F. asthenicus*; 3d. *Hordeolum*, or *Stye*.

60. Genus xiii. — Carbunculus. — Circumscribed, hard, round, and painful swelling, seated in the cellular tissue of the skin and the sub-cutaneous tissue; at first of a livid red colour, afterward black, or of a deep livid hue in the centre or throughout, and covered by lenticular vesicles; terminating in gangrene or sloughing.—*Spec.*: 1st. *C. sporadicus*; 2d. *C. endemicus*; 3d. *C. symptomaticus*. (*See art.* Furuncular Eruptions.)

61. Order III.—Squamosæ—*Dermatites squamosæ — D. serpigmosæ—D. chronicæ—Serpigines*.—Chronic affections characterized by the production, on the surface of the skin, of inorganic, laminated scales, of a whitish gray colour, dry, friable, and slightly elevated above the skin, which remains red and dry when the scales fall off. They are generally slowly developed, spread, and continue for months, or even for many years. They are not contagious.

62. Genus i.—Pityriasis.—A superficial affection, implicating chiefly the cuticle, characterized by a copious desquamation and renewal of this tissue, and, although it may appear on any part, affecting chiefly parts covered by hair.—*Spec.*: 1st. *P. Capitis*; 2d. *P. Palpebrarum*; 3d. *P. Labiorum*; 4th. *P. palmaris et plantaris*; 5th. *P. præputialis et pudentalis*; 6th. *P. versicolor*; 7th. *P. nigra*. (*See art.* Pityriasis.)

63. Genus ii. — Psoriasis. — *Lepriasis*. — Patches of chronic inflammation of the skin, with slight elevations changing into scales—those of *psoriasis* being of different sizes, with irregular margins, and the centres not depressed; those of *Lepriasis* being more or less rounded, slightly depressed in their centres, and their margins raised and reddish.—*Spec.*: 1st. *Psoriasis guttata*; 2d. *P. diffusa*; 3d. *P. inveterata*; 4th. *P. lepræformis — Lepriasis*. (*See arts.* Psoriasis and Lepriasis.)

64. Order IV — Hæmatodes — *Sanguineous Exudations*.—Infiltrations of blood in the cutaneous and sub-cutaneous tissues, generally without manifest elevation of the surface, owing to impaired vital cohesion of these tissues and of their capillaries, and to alteration of the blood.

65. Genus i. — Purpura. — Small, distinct, purple specks or patches in the skin, attended by languor and debility, generally without fever.—*Spec.*: 1st. *P. simplex*; 2d. *P. hæmorrhagica*; 3d. *P. urticans*; 4th. *P. symptomatica vel associata*—of exanthematous and continued fevers. (*See art.* Purpura.)

66. Genus ii.—Scorbutus.—The appearance of patches or blotches of a livid, reddish, or purplish hue, chiefly on the lower limbs, with swelling and bleeding of the gums, great debility and pains, and contractions of the lower extremities, &c. — *Spec.*: 1st. *S. sine Febre*; 2d. *S. febrilis*. (*See art.* Scurvy.)

67. Genus iii.—Petechiæ. — *Ecchymoses*. — Small spots, generally of a reddish colour, but often livid, violet, or blackish, scattered over the surface of the skin, sometimes resembling fleabites or small freckles, remaining a longer or shorter time, varying from an imperceptible point to the size of a hempseed, occurring with or without fever, but most frequently in the advanced stages of adynamic fever. — *Spec.*: 1st. *P. primariæ, vel P. sine Febre*; 2d. *P. secundariæ*.

68. Order V.—Exanthemata—Febres Exanthematicæ — Dermatites Exanthematicæ. —Eruptions of various kinds, preceded by fevers of specific natures and fixed durations, the eruptions being generally also of determinate durations, spreading by infection and contagion, or by both—by specific contaminating miasms or animal poisons, and generally affecting the economy only once. (*See arts.* Exanthematous Diseases and Infection.)

69. Genus i. — Rubeola — Morbilli — *Measles*. — Fever, with frequent sneezing, coryza, redness of the eyes, lachrymation, followed generally on the fourth day by a crimson rash, consisting of stigmatized dots, slightly elevated, on the face, neck, breast, and trunk, usually desquamating on the seventh, occurring frequently epidemically, spreading by infection, and affecting the system only once.—*Spec.*: 1st. *R. vulgaris*; 2d. *R. complicata*; 3d. *R. maligna*; 4th. *R. sine Catarrho*; 5th. *R. sine Exanthemate*. (*See art.* Measles.)

70. Genus ii. — Scarlatina — *Febris Scarlatinosa*.—A continued fever, on the second or third day of which a scarlet efflorescence generally appears on the fauces, face, and neck, spreading over the body, terminating in desquamations from the fifth to the seventh day, frequently attended by affection of the kidneys, and followed by dropsy; often occurring epidemically, propagated by infection, and attacking the system only once.—*Spec.*: 1st. *Scarlatina Hominum.—Var.*: *a. S. simplex*; *b. S. anginosa*; *c. S. maligna*; *d. S. sine Exanthemate*; *e. S. latens*. (*See art.* Scarlet Fever.) *Spec.*: 2d. *Scarlatina rheumatica, vel S. r. epidemica* (*see art.* Scarlatina Rheumatica); 3d. *Scarlatina Equi*,* *vel S. Equi epidemica*; 4th. *Scarlatina Canis*.

71. Genus iii. — Febris Exanthematica — *Typhus — Typhus exanthematicus*. — Typhoid, low, or adynamic fever, attended by stupor, vertigo, confusion of ideas, delirium, or typhomania; by a reddish, papillar eruption on the trunk of the body and limbs; propagated by infection, appearing epidemically, and seldom affecting the system a second time.—*Spec.*: 1st. *F. Typhodes*; 2d. *Typhus contagiosus*. (*See art.* Fever, Typhoid and Typhus, § 485, *et seq.*)

72. Genus iv. — Variola — Small-pox. — Fever, commencing with shivering, and after forty-eight hours, or three days, attended by an eruption of red points, passing successively into pimples, acuminated vesicles, flattened and umbilicated vesicles, pustules, and hard brown scabs; ceasing on the development of the eruption, and returning when the eruption has reached its acme, or from the eighth to the eleventh day; the falling off of the scabs, from the twelfth to the twenty-fourth day, leaving behind them dark pits or

* I have lately had reasons, indeed evidence, for the following inferences: 1st. That scarlatina was originally a disease of the horse, and that it formerly occurred, and has even recently occurred, epidemically, or as an epizooty among horses; 2d. That it was communicated in comparatively modern times from horses to man; 3d. That it may be, and has been communicated also to the dog.

While this article was passing through the press, and after the preceding part of this note was printed, Mr. Percival, veterinary surgeon to the 1st regiment of Life Guards, and author of the very able and well-known work on the Diseases of the Horse, kindly furnished me with additional evidence in support of the opinion I have stated at this place, and when treating of Scarlet Fever. (*See that article*, § 90, &c.) Mr. Percival also referred me to the second volume of his work, where scarlatina in the horse is mentioned.

marks; highly contagious, and affecting the system only once.—*Spec.* 1st. *Variola Hominum.*—*Var.: a. V. discreta; b. V. confluens; c. V. sine Variolis.*—*Spec.* 2d. *Variola Animalium.*—*Var.: a. V. vaccina; b. V. ovilis, vel Clavus.*—*Spec.* 3d. *V. varioloidea, vel Variola Hominis anomala.* (*See arts.* Small-pox and Vaccination.)

73. Genus v.—Variolla—*Chicken-pox.*—An eruption of semi-transparent, glabrous vesicles, with red margins, following and attended by a slight attack of fever; the vesicles seldom passing into suppuration, but breaking on the third or fourth day, concreting into small puckered scabs, and leaving no cicatrices; affecting a person only once.—*Spec.:* 1st. *V. lentiformis;* 2d. *V. coniformis;* 3d. *V. globularis.* (*See art.* Chicken-pox.)

74. Genus vi.—Miliaria—*Sudamina.*—An eruption of whitish or pale reddish vesicles, the size of a millet-seed, in the course of severe infectious fever; the vesicles being distinct, containing a serous fluid, of a whitish, or reddish, or purplish hue, bursting in two or three days, and terminating in a scurfy desquamation.—*Spec.:* 1st. *M. simplex;* 2d. *M. abnormis.* (*See art.* Miliary Eruptions.)

75. Genus vii.—Erysipelas.—Asthenic inflammation of the integuments, consequent upon febrile disorder and a morbid state of the blood, affecting the skin or scalp more or less extensively, with a diffused swelling disposed to spread, propagated by infection when circumstances favour the operation of the poisonous miasm.—*Spec.:* 1st. *E. simplex;* 2d. *E. complicatum.* (*See art.* Erysipelas.)*

76. Order VII.—Dermatites contagiosæ—D. specificæ contagiosæ—Aischrodes—*Eruptiones contagiosæ—Contaminating Eruptions.*—Eruptions propagated by direct or mediate contact, or indeterminate, but generally prolonged duration, often contaminating the whole frame; and certain of them tending to fatal terminations.

77. Genus i.—Scabies—*Itch.*—An eruption of distinct, slightly acuminated vesicles, attended by constant itching; the eruptions varying in character, but often concealing a parasite or *acarus*, either causing or produced by it, unattended by constitutional disturbance.—*Spec.* 1st. *S. Hominis.*—*Var.: a. S. H. vesicularis; b. S. papuliformis; c. S. lymphatica; d. S. purulenta; e. S. cachectica.*—*Spec.* 2d. *Scabies Canis.* (*See art.* Itch.)

78. Genus ii.—Sycosis—*Mentagra.*—A pustular eruption of a pale yellow colour, seated chiefly in the hairy parts of the face, as the chin, upper lip, cheeks, &c., affecting the hair follicles and connected tissues, bursting in the course of some days, and producing brownish crusts, which after one or two weeks leave indolent purplish tubercles; the pustules being renewed in different parts, thus continuing for an indeterminate period, and apparently propagated by a parasitic plant or cryptogamic formations.—*Var.:* 1st. *S. simplex;* 2d. *S. contagiosum.* (*See art.* Sycosis.)

79. Genus iii.—Favus—Tinea—*T. maligna*—*Porrigo*—*Ring-worm.*—A specific chronic inflammation, seated chiefly in the hair follicles, exuding a peculiar yellowish substance, which accumulates and forms a cup around the base of each hair, the aggregation of a number of these resembling the cells of a honey-comb. The hair of the diseased follicles is altered, imperfectly nourished, and falls out; and if the disease be not arrested, the subjacent tissues become affected. This contaminating eruption is usually seated in the scalp, sometimes extending to the face, neck, and other parts of the body, and is communicable to any part of the skin.—*Var.:* 1st. *F. dispersus;* 2d. *F. confertus.* (*See art.* Tinea.)

80. Genus iv.—Pustula Maligna—*Contagious Anthrax.*—A large vesicle filled with a sanious fluid, seated over a lenticular induration, which is speedily surrounded by an erysipelatous areolar swelling, which soon becomes gangrenous, and contaminates the circulating fluids; caused by the contact of a septic animal poison, and communicable from person to person, and from the lower animals to man.—*Spec.:* 1st. *P. M. Hominis;* 2d. *P. M. Animalium.* (*See art.* Pustule, Malignant.)

81. Genus v.—Glanders*—Farcy—*Farcy Glanders.*—Fever of a low and malignant character, attended by chancry sores of the membrane of the nose, and a profuse, offensive discharge, and by pustular eruptions, or tubercular, gangrenous ulcers in various parts of the cutaneous surface, produced by the contact of the poisonous matter.—*Spec.:* 1st. *Simple Acute Glanders;* 2d. *Acute Farcy Glanders;* 3d. *Simple Chronic Glanders;* 4th. *Chronic Farcy Glanders.* (*See art.* Glanders.)

82. Genus vi.—Syphilis—*Syphilitic Eruptions—Venereal Eruptions.*—A distemper contracted generally by impure contact, and characterized, externally, by copper-coloured spots, or by pustules, vegetations, excrescences, ulcerations, swellings, tumours, or imposthumes; internally, by pains in the bones or periosteum, or by caries.—*Spec.* 1st. *S. eczematosæ.*—*Var.: a. lenticularis; b. papularis; c. vesicularis; d. pustularis; e. tuberculoris.*—*Spec.* 2d. *S. squamosa.*—*Var.: a. Leprosa; Psoriasis.*—*Spec.* 3d. *S. vegetans.*—*Var.: a. verrucosa; b. Condyloma; c. Cauliflora; d. Frambœsia; e. Crista-Galli.*—*Spec.* 4th. *S. exulcerans.*—*Var.: a. serpiginosa; b. fissata; c. excavata.* (*See art.* Syphilitic Affections.)

83. Genus vii.—Mycosis.—A contagious disease, consisting of fungous excrescences, occurring chiefly on the face, hairy scalp, or about the organs of generation, resembling a mulberry or strawberry, exuding a yellowish, fetid, and viscous humour, sometimes forming tumours of considerable size, and often attended by pains in the bones, by hoarseness, coryza or ozœna, ulceration of the tonsils, &c.—*Spec.:* 1st. *M. Frambesioides, Frambœsia;* 2d. *M. Mollusœum, Amboyna-pox;* 3d. *M. syphiloides, Sibbens,* &c.

84. Order VIII.—Leprodes—*Leprous Eruptions.*—Morbid degenerations of the skin, depending upon constitutional vice, attended by diminution of the sensibility of the diseased sur-

* The several forms and states of complication manifested by *Erysipelas* are fully described in the article referred to, as they have been observed in many countries and climates by the author, and during different epidemic constitutions.

* This malignant and contaminating distemper is generated in horses from crowding, and from breathing a contaminated or foul air, and is communicated from them to man. There is great reason to believe that most, if not all the maladies comprised under this order, have originated in some of the lower animals, and have extended, with various modifications, to man; and not improbably small-pox has had a similar origin, as well as scarlet fever, as already mentioned.

face, by general hypertrophy of the cutaneous tissues, by originating in endemic influences and bad food, insensibly and slowly, and by their very prolonged duration and hopeless cure.

85. Genus i. — Lepra Tuberculosa — Leprosy—*Leprosy of the Middle Ages—Lepra Hebræorum.* — Dusky-red or livid tubercles, of various sizes, on the face, ears, and extremities; a rugous and thickened state of the skin, impaired sensibility and falling out of the hair, excepting on the scalp; hoarse or altered voice, and ozœna; terminating in ulcerations of the affected surface, and extreme fetor; the distemper being often hereditary, and even contagious by means of the matter discharged from the sores.—*Spec.:* 1st. *Lepra Taurica*—the Leprosy of the Crimea; 2d. *L. anæsthesiaca;* 3d. *L. Hebræorum*—Jewish or Egyptian Leprosy. (*See art.* Leprosy.)

86. Genus ii. — Radesyge. — Lassitude, torpor, and heaviness of the limbs, stiffness and pains of the joints; a pale, bloated, leaden, or reddish appearance of the face, hoarseness of the voice, ozœna; a rugous, scaly, and callous state of the skin, especially in parts, followed by cracks, furrows, tuberculous callosities, and ulcers. — *Spec.:* 1st. *R. vulgaris;* 2d. *R. scorbutica.*

87. Genus iii. — Elephantia — *Elephantiasis of the Arabians.* — Hardness, lividity, and great tumefaction of one or both limbs, or of the scrotum, owing to great thickening of the cutaneous and sub-cutaneous tissues, with an irregular, glabrous, or scaly state of the surface; endemic chiefly in warm countries.—*Spec.:* 1st. *E. vulgaris;* 2d. *E. tuberosa;* 3d. *E. Scrotatis.* (*See art.* Elephantiasis.)

88. Genus iv.—Pellagra.—An endemic and hereditary malady, characterized by thickening, scaly excoriation, cracks, and deep fissures of those parts of the skin exposed to the sun or air; attended by general cachexia, by burning pains in the trunk and limbs, by disorder of the digestive organs and nervous system; at first appearing after prolonged intervals, afterward being more continued, and often fatal.—*Spec.:* 1st. *P. Milanensis;* 2d. *P. Asturiensis.* (*See art.* Pellagra.)

89. Genus v.—Ichthyosis.—Morbid enlargement of the papillæ of the skin, and thickening of lamellæ of the epidermis, either in parts, or more or less generally, presenting irregular compartments often resembling the scales of fish.—*Spec.:* 1st. *I. hereditaris;* 2d. *T. papillaris;* 3d. *I. localis.* (*See art.* Ichthyosis.)

90. Order IX.—Cancrodes—*Cancerous Distempers.* — Cancerous diseases of the skin are characterized by their slow and insidious attack, by their prolonged duration, by their foul ulceration and lancinating pains, by their resistance to treatment, and by their general return to adjoining or remote parts after removal by excision: they depend on a peculiar diathesis, which is often hereditary.

91. Genus i. — Lupus — *Cancer Lupus,* Sauvages.—A disease of all the tissues of a portion of the skin, chiefly of the face, implicating also the subjacent cellular substance; of remarkably slow progress and long duration; always extending either superficially or in depth, with a stinging sensation of heat; passing into ichorous and slow phagedenic ulceration, and destroying the textures to which it extends.—*Spec.:* 1st. *L. superficialis;* 2d. *L. phagedænicus;* 3d. *L. non-exedens serpiginosus.* (The different species of Lupus form the connecting links between the *leprous* and the *cancerous* diseases of the skin. *See art.* Lupus.)

92. Genus ii.—Carcinus.—An alteration of all the tissues of the skin and subjacent cellular tissue, generally commencing as a small, hard, indolent tumour, with itching or stinging; passing into pungent or lancinating pains, and often attended or followed by ichorous and slow ulceration, and by general contamination of the frame. — *Spec.:* 1st. *C. scirrhosus* — *Carcinoma;* 2d. *C. verrucosus* (Chimney-sweeps' Cancer); 3d. *C. medullaris;* 4th. *C. melanæus;* 5th. *C. eburnæus.* (*See arts.* Cancer and Scirrhous and other Tumours.)

93. Genus iii. — Kelis. — A prominent, hard excrescence, sometimes cylindrical, sometimes round or square, flattened in the centre and elevated at the margin, projecting roots into the skin. —*Spec.:* 1st. *K. genuina;* 2d. *K. spuria.*

94. Order X. — Heteromorphæa. — Alterations of the skin, cuticle, or nails, not comprised under the foregoing, nor referable to changes or morbid actions similar to, or allied with, those which characterize the preceding groups.

95. Genus i. — Nævus — *Vascular Nævi* — *Moles.*—A congenital alteration of a portion of the skin, consisting either of a convoluted congeries of capillary vessels, more or less elevated, in the form of a small vascular tumour, above the surface, or of a more diffused and dark or livid-coloured patch, or of a warty, hairy, or discoloured elevation or excrescence.—*Spec.:* 1st. *N. vascularis circumscriptus;* 2d. *N. vascularis diffusus;* 3d. *N. non-vascularis;* 4th. *N. pilosus.*

96. Genus ii. — Verruca — *Warts.*—A very circumscribed, hard excrescence, sessile or pedunculated, sometimes movable, sometimes more fixed, of nearly the same colour as the skin, its surface being rugged, horny, or hard, and not susceptible of inflammation, although the cutaneous papillæ to which it is attached are more than usually vascular.—*Spec.:* 1st. *V. vulgaris;* 2d. *V. Acrochordon.*

97. Genus iii.—Tylosis — *Corns.* — Circumscribed, dry, hard, lamellated callosities, owing to hypertrophy of the cuticle from pressure, which drives the altered structure inward upon the subjacent tissues, developed chiefly on the toes.— *Spec.:* 1st. *T. indurata;* 2d. *T. gomphosa;* 3d. *T. bulbosa.*

98. Genus iv. — Onygosis. — Inflammation with swelling, redness, and pain of the matrix of the nail, causing malformation, induration, eversion, or inversion of the nail. — *Spec.:* 1st. *O. acuta;* 2d. *O. chronica;* 3d. *O. cum Inversione;* 4th. *O. cum Eversione;* 5th. *O. complicata vel associata.* (Often associated with *Psoriasis* and *Lepriasis,* which see, § 23.)*

* [The above arrangement appears, in many respects, preferable to that of Willan. The latter classes cutaneous affections under eight orders. I. Exanthematæ; II. Bullæ; III. Vesiculæ; IV. Pustulæ; V. Papulæ; VI. Squamæ; VII. Tubercula; VIII. Maculæ.— The *syphilitic* virus may produce on the integuments each of the leading forms which characterize the above orders. The great objection to such a classification is, that the papular, vesicular, and pustular forms are not constant, but are sometimes transformed into each other, as a *vesicle* into a *bulla,* and a mere *redness* into a *papule* or *pustule,* so that the distinctions founded on them are often arbitrary and illusory. We see this change of character well illustrated in the *varioloid* or modified forms of small-pox, which may assume almost every variety of cutaneous disease. So nothing is more common than to see *papular* forms of *lichen* pass into a *squamous* state, or *erythema* to present *papular* or *tubercular* elevations, or the *vesicles* of scabies may assume a *pustular* form, as

99. Having exhibited what may be considered a strictly *natural grouping* or *classification* of the changes, appearing either primarily in the tissues of the skin, or contemporaneously with, or consecutively upon, febrile and constitutional diseases, it will be seen that the local connexions, the symptomatic relations, and the more prominent features and alliances of these changes, are brought more completely and more accurately under view. And it will be more clearly perceived that these affections of the skin, so difficult to arrange, and so generally considered and treated as local alterations merely, are more or less important manifestations, in the cutaneous tissues, of disordered or diseased conditions of one or more of the vital functions — of the organic nervous influence or energy, of the digestive and assimilating functions, of the depurating or eliminating functions, and, consequently, of the circulating fluids, and of the constitution or frame in general. Thus, a natural arrangement of cutaneous affections directs the attention more entirely to the relations, and constitutional and visceral dependencies, of these affections, and leads to rational and successful methods of cure, most of the affections grouped under the same order manifesting such morbid relations and connexions as require similar indications and means for each.

100. As *artificial arrangements of cutaneous diseases* have been so commonly received, and as they tend to facilitate diagnosis, I shall conclude this subject by giving the improved modification of the classification of Willan, by M. Rayer, the arrangement of Willan being itself only a modification of that originally published by Plenck.

TABLE.

Division I. Diseases of the Skin.

Chapter I. Inflammatory Affections, distributed according to the Number and Form of their elementary Lesions.

- **Section I. Having a single elementary Form.**
  1. Exanthemata.—Erythema, Erysipelas, Rubeola, Roseola, Scarlatina, Urticaria; Artificial Exanthemata.
  2. Bullæ.—Pemphigus, Rupia; Artificial Bullæ—Blisters, Ampullæ.
  3. Vesiculæ.—Herpes, Eczema, Hydrargyria, Scabies, Miliaris sudatoria (*suette miliaire*), Sudamina; Artificial Vesicles.
  4. Pustulæ.—Variola, Varicella, Vaccinia, Vaccinella, Acne, Rosacea, Sycosis, Impetigo, Favus, Ecthyma; Artificial Pustules.
  5. Furunculi.—Hordeolum, Furunculus, Anthrax.
  6. Gangrenæ.—Anthracion vel Pustula maligna, Anthrax Pestis.
  7. Papulæ.—Strophulus, Lichen, Prurigo; Artificial Papulæ.
  8. Squamæ.—Pityriasis, Psoriasis, Lepra, Pellagra; Artificial Squamæ.
  9. Tubercula.—Lupus, Scrofula, Cancer; Elephantiasis Græcorum; Artificial Tubercles.
- **Section II. Having several elementary Forms.**
  1. Syphilis. — Exanthematica, Bullosa, Vesiculosa, Pustulosa, Squamosa, Papulosa, Tuberculosa, Vegetativa.
  2. Ambustio. — Exanthematica, Bullosa, Gangrenosa.
  3. Pernio. — Exanthematica, Bullosa, Gangrenosa.

Chapter II. Peculiar States of the Skin not referable to Inflammation.

- Anemiæ.
- Congestus sanguinei.
- Hæmorrhagiæ. — Purpura (Petechiæ, Vibices, Ecchymoses, Dermatorrhagia).

Chapter III. Morbid States of the secreting Functions of the Skin.

- Perspirationis Ephidrosis.
- Epidermidis Exfoliatio.

Chapter IV. Neuroses of the Skin.

- Anæsthesia, Hyperæsthesia.

Chapter V. Faulty Structure, or unusual States of one or other of the Elements of the Skin.

- Pigmenti (Achromata; Dyschromata). — Albinismus seu Leucopathia, Nigrities, Ephelis, Lentigo, Chloasma, Melasma, Nævus pigmentarius, Color cæruleus, Color subflavus; Artificial Discolorations.
- Hypertrophiæ. — Papillarum et Epidermidis. — Ichthyosis, Verruca, Producta cornea, Tylosis.
- Gangræna simplex.
- Cicatrices.
- Defectus congenitus Cutis.
- Extensio vel Relaxatio insolita Cutis. — Vasorum Cutis. — Phlebectasia, Angiectasia capillaris, Nævus araneus flammeus, &c. Tumor vascularis.
- Corii, Membranæ cellularis subcutaneæ, et Telæ adiposæ. — Cheloidea, Tumores varii, Elephantiasis Arabica, Andrum, et Pedarthoræ, Barbadoes Leg, &c.

well as the papulæ of prurigo, &c. These and other cases of a similar kind only go to prove that there are no constant characters, nothing absolute in nature, especially in morbid nature. Moreover, these instances of transformation of one genus or species of cutaneous disease into another are only exceptions to a general rule, or accidental complications, which do not materially interfere with an accurate diagnosis.]

Division I. Diseases of the Skin.	Chapter VI. Degenerations.	Degenerationes fibrosæ. Melanosis. Degenerationes tuberculosæ.
Division II. Alterations of the Dependencies of the Skin.	Chapter I. Special Diseases of the Sebaceous Follicles.	Secretio aucta, Vermes sebacei, Levatio follicularis, Tumor follicularis, Calculi Folliculorum.
	Chapter II. Special Diseases of the Pilliferous Follicles.	Atrophia, Defectus congenitus Pilorum, Pili supernumerarii; Incrementum insolitum Pilorum, Coactio Pilorum, Alopecia, Canities, Plica.
	Chapter III. Special Diseases of the Unguial Matrices and Alterations of the Nails.	Onychia, Vitia Conformationis et Structuræ Unguium; Ecchymosis subunguialis; Incrementum insolitum Unguium; Situs insolitus; Ficus; Defœdatio, Degeneratio; Productio et Reproductio, &c.
Division III. Foreign Bodies on the Surface, under, or in the Substance of the Skin.	Parasitic Insects infecting the Skin of Man.	Pediculi; Pulices; Acarus Scabiei; Filiaria medinensis; Œstrus.

101. I may farther add the arrangement proposed by Professor J. H. Bennett, of Edinburgh. He excludes from the orders *Exanthemata* and *Pustulæ* the diseases characterized by excessive fever, as being essentially febrile. From the order *Vesiculæ* he also removes miliaria and varicella, for a similar reason; and he expunges the order *Bullæ* altogether. With some other alterations, consisting chiefly of reductions of genera to the rank of species, he assigns the following as his classification of skin-affections. It will be seen that it is a modification, with several omissions, of the arrangement generally adopted *of diseases of the skin*; while in that which I have given above, I have comprised also the principal of those maladies which generally also *affect or implicate the skin* in a more or less obvious manner:

Order i. *Exanthemata*.
- Erythema.
- Roseola.
- Urticaria.

Ord. ii. *Vesiculæ*.
- Eczema.
- Herpes.
- Scabies.
- Pemphigus.

Ord. iii. *Pustulæ*.
- Impetigo.
- Ecthyma.
- Acne.
- Rupia.

Ord. iv. *Papulæ*.
- Lichen.
- Prurigo.

Ord. v. *Squamæ*.
- Psoriasis.
- Pityriasis.
- Ichthyosis.

Ord. vi. *Tuberculæ*.
- Lepra tuberculosa.
- Lupus.
- Molluscum.

Ord. vii. *Maculæ*.
- Lentigo.
- Ephelides.
- Nævi.
- Purpura.

Ord. viii. *Dermatozoa*.
- Entozoon folliculorum.
- Acarus.
- Pediculus.

Ord. ix. *Dermatophytæ*.
- Porrigophyte (Favus).
- Mentagraphyte (Mentagra).

Bibliog. and Refer. — *Hippocrates*, Opera Omnia, edit. *Vander Linden*, 8vo. Lugd. Bat., 1665, *pluries*.—*Celsus*, De Re Medica, 8vo, *pluries*.—*Galenus*, Opera, fol. Basil, 1562.—*Plinius Secundus*, Historia Mundi, 8vo, edit. *Valpy*. Lond., 1826, lib. xxxvii.—*Cœlius Aurelianus*, De Morbis Acutis et Chronicis, 4to. Amstel., 1755.—*Aretæus*, De Causis et Signis Acut. et Diuturn. Morb. *Boerhaavii* edit., fol. Lugd. Bat., 1735.—*Ætius*, Tetrabiblos, &c., fol. Basil., 1542.—*Paulus Ægineta*, Opus de Re Medica, lib. i. Paris, 1532. (*Distinguished Lepra from Psoriasis.*)—*Rhazes*, in Medicinali Disciplina, ch. xxvi., fol. Venet., 1542. (*Accurately described Smallpox, Measles, &c.*)—*Avicenna*, In Res Medicas omnes, &c., fol. Venet., 1564. Lib. iv., fen. i., tr. vi. (*Gives this, the earliest, diagnosis between Small-pox and Measles*: "*Variola*, at an early period, presents an eminence or elevation above the surface: *Morbillus* is less elevated than variola, and approaches the eye less; it is attended by more lachrymation and less pain of the back." He distinguishes also between Scabies and Prurigo.)—*Avenzoar*, De Rectificatione et Facilitatione Medicationis et Regiminis, fol. Venet., 1549. (*The first to mention the Acarus Scabiei.*)—*Theodorici* Chirurgia, fol. 1519.—*Gilbertus Anglicanus*, Laurea Anglicana seu Compend. totius Medicinæ, 4to. Lugd. Bat., 1510. (*Described the Leprosy of the Middle Ages.*)—*Torella*, De Pudendagra Tract., &c. In Aphrodisiacus *Luisini*, fol. Lugd. Bat., 1728.—*Fracostorius*, Syphilis, sive de Morbo Gallico, libri tres, 4to. Veronæ, 1535, et De Morbis Contagiosis, lib. ii., cap. 15. (*He endeavours to show what diseases of the skin are contagious, and what non-contagious.*)—*Guy de Chauliac*, Chirurgia Tractatus, fol. 1570. (*He pointed out the several eruptions of the scalp, and was the first to show the contagion of Itch.*)—*Vidus Vidius*, Ars Univers. Medicinæ, t. ii., cap. vi.; De Variolis et Morbillis. (*Was the first to notice Varicella.*)—*Fernelius*, Universa Medicina, fol. Colon., 1579. (*Described Syphilitic eruptions, Purpura, &c.*)—*Schenkius*, Observat. Med. Rarior., lib. vii., fol. Lugdini, 1644. (*Alterations of the hair, cuticle, &c.*) — *Sennertus*, Opera, t. iii., lib. v., pars 3tia; De Cutis, Capill. et Ung. Vitiis, fol. Parisiis, 1631.—*L. Joubertus*, De Affect. Pilorum et Cutis, 12mo. Genev., 1572.—*E. Compolongo*, De Morbis Cutaneis, l. iv., tr. iii. Paris, 1634.—*P. Accardius*, Tract. de Morb. Cutaneis, et omnibus Humani Corporis Excrementis, ex Ore *H. Mercuriali*, &c., 4to. Venet., 1572.—*J. Riolani*, Opera Omnia, fol. 1610, p. 547, De Morbis Cutaneis. (*Divides skin diseases into Pustules, Deformities, and Tubercles.*)—*Willis*, De Affectibus Cutaneis, eorumque Morbis, Opera Omnia, 4to. Amstel., 1682, p. 279. (*Distinguishes two classes, with swelling and without swelling.*)—*J. J. Mangeti*, Bibliotheca Medico-practica, fol. Genevæ, 1745. Cutis Morbi, t. i., p. 803, *et seq.*—*D. Turner*, A Treatise of Diseases incident to the Skin, 8vo. Lond., 1714.—*Anon.*, A Compendious Treatise of the Diseases of the Skin, by T. S., 8vo. Lond., 1724.—*T. Fuller*, Exanthematologia, or an Account of Eruptive Fevers, 4to. Lond., 1730.—*J. T. Klein*, Tentamen Herpetologiæ, 4to. Leid., 1755.—*J. C. Nyander*, Exanthemata viva (Linn. Amœn. Acad., v.). Upsal, 1757.—*H. Haquenot*, Tractatus de Morbis externis Capitis, 8vo. Genev., 1759.—*S. Morand*, Réflexions sur la Gale dans l'Hôtel Dieu, 8vo. La Haye, 1767.—*D. Lysons*, Practical Essays (on Elm-bark in Cutaneous Diseases), 8vo. Bath, 1772.—*T. Æry*, Essay on the Nature and Cure of the Essera or Nettle-rash, 8vo. Whitehaven, 1774.—*A. C. Lorry*, Tractatus de Morbis Cutaneis, 4to. Par., 1777.—*D. Lysons*, Farther Observations on Calomel, &c., and on Elm-bark, 8vo. Bath, 1777.—*F. Spilsbury*, A Treatise on Gout, Scurvy, Leprosy, and other Cutaneous Eruptions, 8vo. Lond., 1777.—*H. F. A. de Roussel*, De variis Herpetum Speciebus, &c., 8vo. Cadorni, 1779.—*C. Strack*, De Crusta Lactea Infantum, 8vo. Franc., 1779.—*M. Poupart*, Traité des Dartres, 12mo. Par., 1784.—*J. J. Plenck*, Doctrina de Morbis Cutaneis, 8vo. Vien., 1776, 2d edit., 1783.—*C. Bertrand-Lagrezie*, Essai sur le Traitement des Dartres, 8vo. Par., 1784.—*E. Rigby*, An Essay on Animal Heat, and on Cutaneous Eruptions, 8vo. Lond., 1785.—*J. F. Carrène*, Traité de la Douce Amère dans les Dartres, 8vo. Par., 1789.—*B. de Sauvages*, Nosologia Methodica, 2 vols. 4to. Amstel., 1768, vol. i., p. 32.—*Retz*. Des Maladies de la Peau, &c., qui précèdent des Affections du Foie, 12mo. Par., 1790.—*S. H. Jackson*, Dermato-Pathologia; or, Practical Observations on the Pathology and Cause of Diseases of the Skin, 8vo. Lond., 1792.—*A. C. E. Mangor*, Underretning von Radesygens, &c., 8vo. Kopenh., 1792.—*M. Bem*, Mémoire sur la Décoction du Tabac employé au Traitement de la Gale, 8vo. Par., 1794.—*W. G. Pfefferhorn*, Ueber die Norwegische Radesyge und Spedalskhed, 8vo. Altona, 1797.—*A. Dufresnoy*, Des Caractères, du Traitement, &c., des Dartres, 8vo. Par., 1798.—*Vincenzo Chiarugi*, Delle Malattie Cutanee sordide in Genere

ed in Especie, 2 vols. 8vo. Firenze, 1799.—*J. Ruette*, Essai sur l'Eléphantiasis et sur les Maladies Lépreuses, 8vo. Par., 1802.—*G. Alley*, Essay on an Eruptive Disease arising from the Exhibition of Mercury, 8vo. Dub., 1804.—*N. C. D'Audebert*, Des Exanthèmes épizootiques, &c., 8vo. Par., 1804.—*J. Derien*, Essai d'une Table Synoptique des Mal. de la Peau, 4to. Paris, 1806.—*A. Morilarty*, Description of the Mercurial Lepra, 12mo. Dub., 1804.—*F. Dobscha*, De Cute et de Morbis Cutaneis, 8vo. Jena, 1815.—*J. Klapp*, Chemico-physiological Essays on the Functions of the Skin, 8vo. Phil., 1805. *R. Willan*, Description and Treatment of Cutaneous Diseases, 2 vols. 4to. Lond., 1805-7.—*J. L. Alibert*, Précis Théorique et Pratique sur les Maladies de la Peau, 8vo. Lond., 1810. —*W. Cooke*, A Practical Treatise on Tinea Capitis, 8vo. Lond., 1810.—*D. L. Suasso*, Specimen Varicellæ atque Scarlatinosæ, 4to. Amst., 1810.—*D. L. Suasso*, Specimen Rubeolarum et Morbillorum, 4to. Amst., 1810.—*A. Mathias*, The Mercurial Disease; an Inquiry into the Nature of the Disease produced by Mercury, 8vo. Lond., 1811. —*J. C. Galès*, Essai sur le Diagnostic de la Gale, &c., 4to. Par., 1812. —*T. Luxmore*, Observations on the Nature and Treatment of Tinea Capitis, 12mo. Lond., 1812.—*T. Bateman*, A Practical Synopsis of Cutaneous Diseases, 8vo. Lond., 1813.—*J. F. N. Jadelot*, Notice sur le Traitement de la Gale au moyen des Bains, &c., 8vo. Par., 1813.—*P. F. Percy*, Rapport sur une Nouvelle Mode de Traitement de la Gale, 8vo. Orleans, 1813.—*J. Wilson*, A Familiar Treatise on Cutaneous Diseases, 8vo. Lond., 1813. — *J. L. Alibert*, Descriptions des Maladies de la Peau, fol. Par., 1814.—*R. Willan*, A Practical Treatise on Porrigo and Impetigo, 4to. Lond., 1814.—*T. Bateman*, Delineations of Cutaneous Diseases, 4to. Lond., 1815. —*Chaussier and Adelon*, Dict. des Sc. Méd. (art. *Peau*), t. xxxix. Par., 1819.—*W. A. Haase*, De Exanthematibus Chronicis in universum, 4to. Lips., 1820.—*T. M. Kelsen*, A few Hints relative to Cutaneous Complaints, 8vo. Lond., 1820.—*S. Plumbe*, A Practical Essay on Ringworm of the Scalp, &c., 8vo. Lond., 1821.—*C. H. Wilkinson*, Remarks on Cutaneous Diseases, 8vo. Lond., 1822.—*Lud. Ritter von Braun*, Ueber die Erkenntniss und Behandlung des Pemphigus, 12mo. Frankft., 1823. — *J. Frank*, Praxeos Medicæ Universæ Præcepta, 8vo. Leips., 1815-25, Pars ii., vol. i., Doctrina de Morbis Cutis.—*T. Chevalier*, Lectures on the Anatomy and Functions of the Skin. 8vo. Lond., 1823.—*A. Clarke*, An Essay on Diseases of the Skin, 8vo. Lond., 1823.—*C. A. Bergmann*, Die Krankheiten der Haut, &c., 8vo. Leips., 1824.—*M. Kickhorn*, in Journ. des Progrès des Sciences Méd., t. iii., p. 88 (*Physiologia Cutis*); ibid., t. vii., p. 79; ibid., t. viii., p. 61; ibid., t. ix., p. 55.—*Westrumb*, in ibid., t. xi., p. 13, et Archives Génér. de Médecine, t. xxi., p. 113.—*Bostock*, Transact. de Med. Chirurg. Society, vol. xiv., p. 424.—*P. J. Martin*, in ibid., vol. ix., p. 52.—*H. Earle*, in ibid., vol. v., p. 96, and vol. vii., p. 406. — *S. Plumbe*, A Practical Treatise on Diseases of the Skin, 8vo. Lond., 1824.—*P. Rayer*, Traité Théorique et Pratique des Maladies de la Peau, 2 vols. 8vo. Par., 1826-7. Translated by *R. Willis*, 8vo. Lond., 1835.—*Alibert et Biett*, in Journ. Hebdom. de Méd., t. iii., p. 289, &c.; t. iv., p. 43, &c.—*W. C. Dendy*, A Treatise on the Cutaneous Diseases incident to Children, 8vo. Lond., 1827. — Lond. Med. Gazette, vol. vi., p. 464. — *A. Cazenave, H. E. Schedel*, Abrégé Pratique des Maladies de la Peau, 8vo. Par., 1828. Translated by *T. H. Burgess*, 8vo. Lond., 1842.—*L. Hunefeld*, Die Radesyge, oder das Scandinavische Syphiloid, 8vo. Lips., 1828.—*L. A. Struve*, Synopsis Morborum Cutaneorum. Uebersicht der Hautkrankheiten (Lat. et Germ.), fol. Berl., 1829.—*A. T. Thomson*, Atlas of Delineations of Cutaneous Eruptions, 8vo. Lond., 1829. —*T. Bateman*, Synopsis, &c., with Notes by *A. T. Thomson*, 8vo. Lond., 1831.—*Paget*, On a Natural Classification of Diseases of the Skin, in Edin. Med. and Surg. Journ., vol. xxxix., p. 255.—*J. Green*, A Practical Compendium of the Diseases of the Skin, 8vo. Lond., 1835. —*L. A. Struve*, Synopsis Morborum Cutaneorum, fol., c. fig. Berlin, 1829.—*G. B. Fantonetti*, Trattato Teorico e Pratico dei Mali della Pelle. Milano, 1830.—*R. Hunt*, Synopsis of Diseases of the Skin, 12mo. Lond., 1838.—*R. Willis*, Illustrations of Cutaneous Diseases, with a Summary of their Symptoms, Diagnosis, and Treatment, folio, coloured plates. Lond., 1839.—*J. Ericksen*, On Diseases of the Scalp, plates, 8vo. Lond., 1842.—*T. Hunt*, Practical Observations on Diseases of the Skin pronounced intractable, 8vo. Lond., 1847.—*E. Wilson*, On Diseases of the Skin, 2d ed., 8vo, with plates. Lond., 1847.—Also on the Management of the Skin as a means of Promoting and Preserving Health, 2d ed., 8vo. Lond., 1847.—Portraits of Diseases of the Skin, fol., fascic., x. 1850.—*A. T. Thomson*, A Practical Treatise on Diseases affecting the Skin. Completed and edited by *E. Parkes*, 8vo. Lond., 1850.—*J. H. Bennett*, The Classification and Diagnosis of Cutaneous Diseases, in Edin. Month. Journ. of Med. Science. April, 1850, p. 346. See also the Bib. and Ref. to the individual diseases of, or affecting, the skin.

[Am. Biblioc. and Refer.—*Casenave* and *Schedel*, Manual of Diseases of the Skin, with Notes and Additions, by *T. H. Burgess*. Revised and Corrected, with additional Notes, by *H. D. Bulkley*, M.D., 12mo. *S. S.* and *W. Wood*, New York.—*E. Wilson, Am. ed.* of Treatise on Diseases of the Skin. 1850.—*N. Worcester*, Synopsis of the Symptoms, Diagnosis, and Treatment of the more Common and Important Diseases of the Skin, 60 coloured figures, 8vo.—*S. Plumbe, Am. ed.* Practical Treatise on Diseases of the Skin, their Constitutional Causes and Local Character, &c., coloured plates, 8vo.—*P. Rayer, Am. ed.*, Diseases of Skin. Phil., 4to.]

SLEEP AND SLEEPLESSNESS.—Classif.: General Pathology—Symptomatology—Therapeutics.

1. Definit.—i. Sleep.—*The suspension of sensation and voluntary motion, occurring at periodic intervals, continuing for some hours, then terminating spontaneously, or by some irritation or excitement, being indispensable to the due discharge of all the sensory, intellectual, and voluntary functions.*

ii. Sleeplessness.—*The non-recurrence of this periodic suspension of sensation and voluntary motion, or the imperfect or interrupted recurrence of it, as a symptom of disease, or as the chief manifestation of disease.*

2. I. Sleep is necessary to the due discharge of the sensory, intellectual, and voluntary functions for any considerable period; and if wakefulness be much prolonged beyond eighteen or twenty hours, even during states of excitement or anxiety, an overpowering disposition to sleep is experienced; although powerful constitutions, on trying occasions, may continue awake for much longer periods. The organic functions, or those functions which are actuated by the organic, nervous, or ganglial system, and which consist chiefly of digestion, assimilation, circulation, nutrition, and secretion—all these functions commonly termed involuntary—require not the suspension or repose constituting sleep, which, if extended to them, would soon terminate life. But these functions are performed—at least some of them—with less activity during this period. Sleep is not only indispensably requisite to the adequate discharge of the functions performed by the cerebro-spinal nervous system, but is also necessary to the due nutrition of this system—to the due supply of the waste of nervous power, and even of intimate nervous organization, required for the healthy performance of the functions of this system. While the ganglial nervous system, on the one hand, discharges its functions through the media of the several organs actuated by it almost continuously, and without marked repose or waste of substance or structure, the cerebro-spinal nervous system, on the other hand, demands periodic or alternate repose and action, in order to insure its healthy function and organization, and to prevent excessive exhaustion and waste.

3. The restoration of cerebro-spinal nervous power consequent upon sleep has been, by some physiologists, attributed to the due nutrition of the cerebro-spinal organs during this period, as much as to the suspension of exhaustion and waste, this restoration and nutrition being requisite in proportion to the antecedent waste, which, if not duly restored, successively increases until the intimate organization of these nervous centres ultimately undergoes irreparable and tangible change. In early age and during manhood, the voluntary actions and mental exertion may be continued during comparatively long periods

without exhaustion, for nutrition, or the restoration of the nervous expenditure, is then more rapid and complete than in advanced or old age; whereas, at this age, these efforts, especially such as are of a very exhausting nature, are followed by a more prolonged and a more urgent want of repose; and if repose be not obtained, disease, or even disorganization, more especially inflammation, in the earlier epochs of life, and apoplexy and paralysis in advanced age, may speedily supervene. Thus we observe that when, in advanced life, mental exertion, bodily fatigue, or venereal indulgences are carried too far, the disposition to sleep is most urgent, and, if the required repose be not obtained, the risk from the supervention of these maladies becomes great.

4. The seat of consciousness, or of active sensation, has been long since supposed by some writers to be different from that of the mental faculties; and it has been believed that, while the former is in the central and basilar parts of the brain, the latter are to be referred to the convolutions of the hemispheres. During sleep, therefore, the more central parts, the seats of sensation, are altogether inactive, or incapable of feeling or perceiving impressions made upon the senses, and thence conveyed to those parts, unless the impressions be so strong as to rouse them to a state of activity; but while sleep consists of the inaction or repose of these parts, and of the hemispheric convolutions as well, when sleep is complete or profound, a less profound form of sleep consists of a less complete state of inaction of both the hemispheric convolutions and the central cerebral structures. This latter, or imperfect state of sleep, comprises numerous phases or grades from that attended by indistinct *dreams*, through the various states of *dreaming*, until the half-waking and half-sleeping state is reached.

5. During *dreaming*, the structures of the brain more especially concerned in the mental manifestations are not completely or entirely in a state of repose, nor can it be admitted that the seats of conscious sensation are also completely or profoundly inactive, otherwise the former manifestations could not be perceived or remembered by the latter. It will be, therefore, more correct to view the several portions of the brain concerned in sensation, mental manifestation, and volition, as not completely, although more or less, inactive during sleep, unless the sleep be very deep, and altogether without dreams; for more frequently, especially when the dreams are distinct, and are recollected upon awakening from sleep, certain parts of the brain continue more or less active, repose not being universal and complete. Dreaming during sleep in health may be rendered more vivid and remarkable by the excitement of the brain during the various mental or physical exertions of the day, or by the nature of the food or drink, or by disorders of the digestive functions, the imagination and reasoning powers being either partially or actively exercised, and the results of these being remembered when waking. This partial or irregular activity of the hemispheric portions of the brain during sleep is often still more strongly manifested during the imperfect sleep of fever, and is even expressed more or less audibly and actively; those suggestions, conceptions, and unconnected ideas, constituting dreams in health, passing into more or less manifest delirium in states of disease. Thus various grades of sleep and of dreaming may exist either occasionally or habitually during the ordinary health of the individual; and thus, during disease, various grades or phases of delirium, passing into sopor, lethargy, and coma, may occur, as the states of nervous power and of the circulation may favour their appearance.

6. During sleep, especially when it is not profound, the sensorium may be influenced in various ways, so as to give rise to changes of position, to various conceptions, and even to acts, without a conscious perception of them. An uneasy position, or the muscular sense, may occasion during sleep a complete change of position—a person may turn from one side to the other, without being conscious of either the cause or the act of turning. In this case, the uneasiness influences the sensorium, or induces an unconscious sensation sufficient to give rise to a similarly unconscious volition productive of the act, but there is no perception of it. During dreaming, the conception of numerous occurrences, circumstances, and acts passes through the mind with greater or less rapidity, and generally in a very incongruous and unconnected manner. The various processes of thought which had engaged the waking brain are often partially renewed or suggested during sleep, or while the mind is unconscious of impressions on the senses, frequently in singular forms, or with inconceivable rapidity, or in disjointed or impossible states; these suggestions or conceptions being, however, sufficiently strong, in many cases, to excite conscious sensation, so far, at least, as to be partially remembered on waking.

7. These suggestions seldom amount to perfect conceptions, but are loose and unconnected, generally faintly entertained, and soon extinguished. They are the results of imperfect or disordered states of repose of the parts of the brain more especially concerned in the mental processes. They may occur without any excitement or stimulus of the senses, or of parts distant from the brain, as apparitions merely of anterior processes of thought or of acts, in partial or newly-combined and bizarre forms, without any circumstance which can account for their appearance; and they may assume the most lively characters, and be attended by more or less correct reasoning, and by the highest flights of imagination. But in some instances they may be referred, with great accuracy, to antecedent occurrences, occupations, or mental processes, of which they are the imperfect or distorted remains or apparitions, although sometimes the most lively or intense, but also the most incongruous conceptions. In other cases they are excited by local impressions, or irritants, or changes which sympathetically affect the brain, so as to give rise to those conceptions which constitute dreams, or even to acts which those conceptions occasion. Thus the irritation of the bladder may give rise, during sleep, to conceptions connected with micturition, and this act may even follow without waking, although it generally immediately terminates the sleep. Thus, also, irritation of the vesiculæ seminales produces lascivious dreams, and not infrequently is followed by seminal emission. Various internal excitants, moreover, or external agents, acting during sleep, may be followed by dreams having a more or less obvious connexion with the causes which produced them; the impressions made by such agents calling up

certain related, although incongruous or disjointed conceptions in the sensorium.

8. The conceptions arising in the manner now explained—either with or without any obvious excitant or physical cause — may be so slight and evanescent as hardly to be remembered upon awaking, and as not to occasion any change of position, or any act implying volition, of either a conscious or unconscious kind. But not infrequently the conceptions formed during sleep, when lively or active, give rise to volition, and are followed by acts. The individual acts the dream, or performs the conception passing through his mind, without being so conscious of his act as to remember it when he awakes, or when the functions of sense and perception are fully restored. This constitutes *somnambulism*, or sleep-walking, a state of partial or imperfect sleep, which has been sufficiently noticed, in respect of its nature and relations, when treating of *the pathology of* PARALYSIS (see § 193, *et seq.*).*

9. *Sleep*, that it may be refreshing and restorative to both body and mind, should, 1st, take place at a stated and proper hour, and after stated intervals; 2d, continue for a certain period of time, without being prolonged much beyond that time; 3d, be aided by the necessary preparations to secure ease of position, and to prevent disturbance of the vital and animal functions. When sleep is obtained without these precautions — when it occurs at unseasonable hours—when it is broken or unusually shortened — when it is taken on a loaded stomach, or after the ingurgitation of heating or stimulating beverages—when the position of the body is unusual, cramped, or uneasy — when the stomach or bowels are distended by flatulence, or irritated by acidity, then it is either disturbed or unsound, unrefreshing; the body and mind are left, on waking, either languid or torpid, and the requisite exertions or engagements of the following day are entered upon with disrelish, and are soon productive of fatigue.

10. To secure refreshing sleep, a sufficiently early and a punctual period of retiring to repose should be adopted, after having spent a reasonable period in the open air, chiefly in exercise suited to the state and constitution of the individual. The diet should be digestible and moderate in quantity, and such as will not favour flatulency or acidity. Repose ought not to be taken for some hours after a full meal, and the place in which it should be sought ought to be airy and dry, the temperature being not above 70° of Fahr. or below 55°. The bed should be firm and moderately elastic, slightly elevated towards the head, and the clothes, both above and under the person, sufficiently warm and light. All the day-clothes should be taken off. The chamber ought to be large and airy, and light and noise excluded. If air be not sufficiently renewed in the sleeping apartment, sleep becomes feverish or restless, and the individual awakes unrefreshed and uncomfortable.

11. The *amount* of sleep should vary with the age, the occupation, the constitution, and the habits of the individual. During infancy and childhood, prolonged periods of sleep are required for the nutrition of the nervous masses and the growth of the body. Infants sleep the greater part of the twenty-four hours. Children require twelve or fourteen hours; older children, or those from eight years until fourteen or fifteen, about ten hours. From commencing puberty until full growth, or from twenty-five to thirty, eight hours are sufficient. After this age, the duration of sleep should range from six to eight hours, according to the occupations or exertions, mental or physical, of the individual.

12. *The causes of sleep* are not only the fatigue, the exhaustion, and the periodicity characterizing all our sensorial actions and manifestations already insisted upon as requiring restoration and re-enforcement of nervous power during the periods of repose, but also various states and phenomena which act more or less on the sensorium of those who are either incapable or not in a situation of having recourse to those mental or physical operations which more certainly conduce to repose. The entire *absence* of sensorial impressions, or the *monotonous repetition* of such impressions, will frequently occasion sleep, as occurs when listening to a drawling, monotonous reader or preacher, or to distant sounds of unvarying loudness. Persons who have become accustomed to sleep, notwithstanding the continuance of sounds which would keep the unaccustomed awake, frequently cannot sleep when deprived of these sounds, or when removed to perfect stillness, or when they are within the reach of sounds of a different intensity or key. Friction of various parts, especially in nervous or susceptible persons, prolonged combing of the hair, monotonous sounds of any kind, continued and gentle motions of the body in the same directions, rapid transport of the body backward, or with the back placed towards the place where the body is carried, as when thus seated in a carriage, or on a railway, and directing the mind to uninteresting objects or matters, severally induce sleep, especially when other circumstances concur in causing this effect. There are, moreover, other causes which produce sleep, and which may be viewed as pathological, inasmuch as they are more or less morbid in their consequences or nature: they require merely enumeration. Venereal excesses may occasion sleep, lethargy, or sopor, especially in the aged; extreme exhaustion of the organic

* [Under this head it may not be irrelevant to allude to a class of phenomena, now generally recognized by physiologists, and which have been sometimes erroneously called mesmeric. They are, 1st. A state of complete *coma* or perfect insensibility, analogous to hysteric coma, and usually distinguished from the coma of cerebral oppression by a constant twinkling movement of the eyelids. In this condition some surgical operations may be performed without any consciousness on the part of the patient. 2d. A state of somnambulism or sleep-walking, which may present all the varieties of the natural somnambulism from a very limited awakening of the mental powers to the state of complete double consciousness, in which the individual manifests all the ordinary powers of his mind, but remembers nothing of what has passed when restored to his natural waking state. This state of somnambulism, in the form which it generally takes, is characterized by the facility with which the thoughts are directed into any channel which the observer may desire by the principle of "suggestion," and by the want of power on the part of the somnambulist to apply the teachings of ordinary experience to the correction of the erroneous ideas which are thus made to occupy the mind. 3d. A frequent phenomenon of this condition, and one which has its parallel in natural somnambulism, is a remarkable *exaltation of one or more of the senses*, so that the individual becomes susceptible of influences which, in his natural condition, would not be in the least perceived. 4th. In this condition, also, the *muscular system* may be excited to action in unusual modes, and with unusual energy. And, lastly, it is maintained by some physiologists, as Dr. ELLIOTSON, that various effects may be produced upon the *organic functions* by what is called mesmeric influence, and thus that it may exert an important curative effect. More extended observations, however, are required before any such curative influence can be admitted as established.—(*Carpenter's Principles of Human Physiology, Am. ed.*)]

nervous and cerebro-spinal energies; a plethoric state of the brain, or of the vascular system generally; the superabundance of excrementitious materials in the blood, or an imperfect oxydation of this fluid; the administration of narcotizing substances; and various related morbid affections, induce sleep, either excessive as respects its continuance, or of a disordered or unrefreshing kind (see *art.* COMA and LETHARGY).

13. *The accession of sleep* is very different in different persons, or when sleep supervenes naturally and healthily, and when it is induced artificially, or assumes more or less of a disordered character. Healthy sleep may occur either suddenly or gradually. Disordered sleep is generally slow and partial in its accession. The sensorium gradually loses its control over the current of the ideas, which becomes unconnected and incongruous; and in this state of transition—of half sleeping and half waking—a dreamy, or even a delirious existence is passed for a longer or shorter period, until an entire loss of sensibility of external objects—a more complete torpor of the sensorial parts of the brain—supervenes, and sounder sleep is induced. The disposition to and indisposition from sleep are very much in the power of the individual, for, by abstracting the mind from all objects of sense, and from the suggestions or ideas they excite, by ceasing every phase or mode of volition, and by ceasing to think upon or respecting any topic requiring mental exertion, or calculated to occasion mental excitement, or by directing the attention to, and fixing it on, a single, uninteresting, unexciting, or simple object, and engaging the thoughts with no other, the sensorium will soon lapse into that state of torpor productive of sleep.

14. The accession of sleep is often *attended by various morbid phenomena*, especially in persons predisposed or subject to any nervous, or spasmodic, or paralytic affection. These consist chiefly of startings, twitchings, contractions, or cramps of one or more limbs or muscles; of convulsions and spasmodic laryngeal disorders, or croup, in children; of epileptic fits, more or less complete, or merely slight or partial, and even of various mental and spectral illusions. Any of the foregoing may occur upon the accession of sleep, and before sleep has become complete, or immediately upon falling asleep; or during the commencement of sleep, when sensation is partially or suddenly excited by any excitant or disturbing cause.

15. *Awakening* from sleep may be either sudden or gradual. The healthy and sufficiently sound and prolonged sleep terminates spontaneously and immediately, leaving the person who has enjoyed it refreshed and active; or if it be terminated by impressions made upon the senses, these impressions produce this effect readily and completely — an effect not observed from them when the sleep is of that morbid kind which constitutes lethargy, stupor, sopor, or coma, in its several morbid grades. Disordered, unsound, or insufficient sleep generally passes into that state of half sleeping and waking noticed above (§ 4), and, according to the circumstances causing the disorder or unsoundness, is attended by the dreamy, or even by the delirious states of temporary existence just mentioned, until stronger impressions on the organs of sense, or diminished torpor of the sensorium — the increased activity of the sensorial or conscious portions of the brain —are followed by the restoration of the several manifestations or functions of this organ.

16. *Sleep may be excessive:* 1st. As respects its duration; 2d. As regards its profound character, and the difficulty of arousing the person from it; and, 3d. In the frequency of its recurrence. These are diseased states, and either amount to one or other of those described under the heads COMA and LETHARGY, or generally pass into one or other of them, if not soon arrested by a treatment appropriate to the exciting and pathological causes which occasion them. Too profound or prolonged sleep should always excite suspicions of a disposition to, or the actual presence of, cerebral congestion, owing either to nervous exhaustion, or to a morbid state of the cerebral circulation, or to an interrupted return of blood from the brain, occasioned by pulmonary or cardiac engorgements, or to a morbid state of the blood itself. To one or other of these morbid conditions, excessive or deep sleep, especially when amounting to lethargy or sopor, may be imputed, the existence of either condition, or of more than one, generally becoming manifest upon a careful examination of the case.*

17. II. SLEEPLESSNESS — *Wakefulness* —

[* A very remarkable case (*Cataphora of* Good) was exhibited in the city of New York, in the summer of 1853, in the person of a man named *Cornelius Vroman*, who was said to *have slept five years*, with intervals of wakefulness amounting to not more than three days in that time; the longest period being sixteen hours. He lay like a person in ordinary sleep, the eyes nearly closed, but rolled upward, with a quivering of the eyelids, and resistance to opening them, with rigidity and fixedness of the muscles of the limbs, as in catalepsy, or artificial somnambulism; respiration rather slower than natural, breathing slightly stertorous, pulse some seventy-five strokes in the minute, soft and weak; mouth slightly opened, with spasmodic contraction of the muscles on attempting to open it by force. The body was very much emaciated; the arms folded upon the breast, and any attempt to remove them strongly resisted. The muscles generally were rigid and tense when the effort was made, and it was impossible, without violence, to change the position of the limbs. When placed erect on his feet, it required some moments to balance him exactly, but afterward he retained the same position, as in catalepsy, and once for three days at a time. He was a farmer, from the town of Clarkson, New York. In June, 1848, he employed a physician for pain in the stomach and head, which gradually resulted in a disposition to sleep, until it was impossible to wake him. Wakeful intervals of short duration would occasionally occur, but of late once only in about six weeks; and when awake, he seemed totally unconscious of his peculiarity. He then straightens himself up, and walks as limberly as others. His diet has consisted chiefly of milk, which has to be administered by prying open his jaws as in *trismus*. Once he went without food for five days, during which there was no change in his symptoms. When the seizure commenced, his weight was 100 pounds; in October, 1853, it was but 90. Height 6 feet 2 inches. Urinary secretion high coloured, of about the normal quantity, and discharged once or twice a day, and not involuntarily. Alvine evacuations very scanty, occurring only at intervals of from six to twenty days. He had been subjected to various treatment, as bleeding, setons, issues, blisters, tonics, stimulants, &c., but without any effect.

We have called this a case of Lethargy, or *Cataphora* of Dr. Good, of which he has given an example that continued five years, in the person of a young lady eighteen years of age, whose mind had been previously in a state of great anxiety; the remissions recurred irregularly twice or three times a week, and rarely exceeded an hour or two; during these periods she sighed, ate reluctantly what was offered to her, had occasional egestions, and instantly relapsed into sleep. In the case, however, that we have related, were combined the symptoms of *ecstasy* ("total suspension of sensibility and voluntary motion; mostly of mental power; pulsation and breathing continuing; muscles rigid; body erect and inflexible."—*Good*), with the most prominent ones of *catalepsy* ("the limbs and body yielding to and retaining any given position"). The disease resulted fatally in November, 1853, having continued from the 19th of June, 1848.]

Ἀγρυπνία—*Insomnia*—*Pervigilium*—is a symptom of disease, but it sometimes is also a forerunner of the worst forms of disease, or occurs before any very obvious disorder can be recognized. An interrupted sleep, or a more or less incomplete form of wakefulness—states of partial sleeplessness—may occur in consequence of too varied or too anxious states of mental occupation, or of the use of various beverages, or indigestible articles of food, near the period of repose, which prevent the accession of sleep, as green tea, coffee, &c. But when it is not induced by any of these causes, and even when the wakefulness occasioned by them is complete, it should be considered as a most important symptom, and its pathological cause ought to be carefully investigated. *Wakefulness* may be either *partial* or *complete:* the former may be so frequent as to be habitual, or merely occasional; the latter cannot be of long continuance without being followed by dangerous disease.

18. i. *Partial or incomplete sleeplessness* is of frequent occurrence, especially in persons whose minds are much and anxiously engaged, or whose occupations subject them to great mental exertion, or to the vicissitudes of fortune. It may likewise follow the unreasonable indulgence of grief, severe losses of any kind, and the numerous vexations and disappointments of life. When it is continued nightly for a long period, it may superinduce serious disease of the brain, or of the heart, or some other organ, as the cause of the wakefulness may operate upon the frame; the nature of the cause having a more or less special influence upon either the brain, heart, lungs, liver, &c., according to the susceptibility or predisposition of these organs. Partial insomnia is often occasioned by sleeping with too many clothes on the bed, or by the use of curtains to the bed, and to the closeness with which they are drawn, or by an insufficient renewal of the air in the sleeping-chamber. These causes, especially the breathing of an impure or self-contaminated air, induces a febrile state, attended by headache, restlessness, and more or less complete pervigilium, the tongue and mouth being foul and clammy in the morning, and the person unrefreshed, or even much more fatigued and disordered than when repose was sought.

19. Partial sleeplessness has always a most intimate relation to the states of morbid action, and, according to these states, is attended by peculiar features. The sleeplessness may be occasioned, or the sleep may be broken, interrupted, or unsound, by indigestion, flatulence, or acidity of the stomach or bowels, or it may be disturbed by cramps or spasms of various muscles. This association is often observed in gouty and dyspeptic persons: the irritation of the prima via by flatus, acidity, or undigested articles disorders the ganglionic nerves, and, through the medium of them, disturbs the sleep, excites the brain and spinal chord, the irritation thus extended to these centres being, in some cases, reflected from them to one or more of the muscles of voluntary motion, occasioning spasm or cramp. When wakefulness proceeds from the disordered digestion consequent upon indigestible articles of food, or upon an overloaded stomach, there is not merely more or less restlessness, but also often a feeling of oppression, a disposition to sleep, which, when it takes place, is generally attended by disturbing or fearful dreams, or by the nightmare, the individual waking up in fright, with a dry mouth and excited pulse.

20. When this state of sleeplessness is occasioned by mental exertion, or by continued mental rumination, when retiring to rest, on the subjects which have just before engaged the mind, whether these subjects be abstract or emotional—whether they be intricate or difficult in their nature, or calculated to perpetuate anxiety or distress—then feverishness, headache, restlessness, thirst, &c., are apt to occur, and to render sleep, when it at last takes place, unquiet, disturbed by dreams, and unrefreshing. In some cases of this kind, more especially, the person often dreams aloud, and, in rare instances, particularly when there is much nervous susceptibility and mental activity, he *acts his dream*, and evinces a more or less complete state of *somnambulism*, or *sleep-walking*. A youth, whom I knew, was much engaged in becoming an accomplished player on the flute; his dreams had frequent reference to this study, and he often disturbed the family by his performances on this instrument during his sleep. I was called one night to a young lady, who had disturbed and alarmed her relations by walking through more than one of her apartments in her night-dress, singing some songs she had been recently practising. And another young lady, whom I saw on this account, sometimes left her chamber in her sleeping-dress, and sat down to the piano in another room and performed some pieces of music which she had been learning. Females, who are somnambulists, generally first evince this disorder either at the period of puberty, previously to, or about, the accession of the catamenia, or where this discharge is interrupted or otherwise deranged.

21. Persons labouring under disease of the substance or valves of the heart are subject not only to imperfect and disturbed sleep, but also to fearful dreams; and if they fall asleep in an uneasy position, or on the left side, in some cases, they generally waken up soon after from a fearful dream, as falling from a precipice, drowning, &c.; their dreams being more pleasant when the position is more comfortable. The same phenomena are often observed in dyspeptic subjects, when the stomach or colon is distended by flatus; for, when the individual lies on the left side, the weight of the body presses on it, while the liver presses on the stomach and colon, and the flatulent distension of these pushes the diaphragm upon the heart, and embarrasses the circulation through this organ.

22. There are very few chronic diseases of which partial wakefulness is not a symptom; but it is more especially distressing in atonic gout, rheumatism, affections of the skin, and disorders of the urinary organs. Anomalous states of hysteria, the several forms of dyspepsia, and derangements of the functions of digestion, are, as well as the foregoing, attended by partial wakefulness, or by a disturbed, insufficient, and unrefreshing sleep. Certain beverages and articles of diet may be the chief cause; and when these are relinquished, the sleep becomes more sound. Tea, especially green tea, coffee, and spirituous liquors, often occasion wakefulness; and a full meal of animal food, especially of pork, late in the day, often causes either restlessness, loss of sleep, or disturbing dreams. It would be unprofitable, as it is unnecessary, farther to notice the contin-

gent occurrence of want of sleep in chronic diseases, as it is very generally observed and readily accounted for.

23. ii. *Complete sleeplessness* is often a most important symptom of disease, and when it occurs without any manifest physical disorder to account for its existence, it should be viewed as the forerunner of dangerous disease, particularly of the brain. Complete wakefulness, even for many nights, is generally attendant upon nervous and other fevers of a continued type, upon inflammations of the brain, and upon inflammatory affections of an acute character. It also attends the eruptive fevers, rheumatic fevers, delirium tremens, the gouty paroxysm, painful and spasmodic maladies, and pestilential distempers. When it is continued for many nights and days, vital power and resistance become exhausted, and delirium, followed by coma, is very apt to supervene. All acute diseases attended by febrile excitement or increased vascular action, especially towards or during the night, are characterized by a more or less complete insomnia; and when the febrile action subsides, then sleep returns, the occurrence of sleep often proving critical of these diseases (see *art.* CRISIS).

24. When insomnia is not followed by sound repose after a long continuance, it often passes into a state of half sleeping and half waking, in which the ideas of the patient are rapid, unconnected, and otherwise disordered, and generally expressed aloud, or in a low key. He dreams aloud in this half-conscious condition; or becomes more obviously delirious. The slighter forms of this delirium have usually been called wanderings of the mind, and at first they appear only occasionally, or during the night merely; but, when they are not soon followed by composed sleep, are apt to be more continued, more fully developed, and to pass ultimately into sopor or coma.

25. If wakefulness is unattended by any very manifest disorder, or even by slight disorder, or such as appears insufficient to account for it, some serious disease of the brain should be viewed as impending, although a considerable time may elapse before the advent of it. In these cases, the symptoms more especially connected with the nervous systems should be carefully investigated, in connexion with the occupation, habits, modes of living, arrangements for sleeping, ventilation, &c. The temperature of the head, action of the carotid arteries, the functions of sense, and those of digestion, assimilation, and excretion, ought to be carefully examined, and a treatment based on the report thereby obtained should be adopted. A dignitary of the Church consulted me for prolonged insomnia. He evinced no other disorder. Palsy, or apoplexy, or coma was dreaded, and the treatment was directed accordingly. He was soon very much better, and continued so for two or three years, during which time I did not see him; but at the termination of it he was seized with apoplexy, at a great distance from London, and died in a few hours. An eminent physician and author was afflicted with insomnia, he afterward became insane. A patient to whom I was called had long been subject to wakefulness, and was afterward attacked with phrenitis.

[There is a form of sleeplessness which is often the precursor of insanity. Sometimes, perhaps generally, it is accompanied by the well-known symptoms of incipient mental derangement, and, unless it is relieved, confirmed insanity is very sure to follow. Diligent inquiry should in all cases be made as to its causes, and the most effectual and prompt measures resorted to for their removal. An aperient, followed by a full dose of a suitable narcotic, repeated according to circumstances, will often succeed in overcoming the watchfulness.]

26. Pervigilium is not infrequent *in nervous females, after their confinements*, especially when they breathe a close or impure air, or when they have experienced hæmorrhagic or exhausting discharges. It may pass gradually, or even suddenly, into delirium or mania, if not arrested by an appropriate method of cure. I have been called to several cases of this kind, where the disorder was aggravated by a treatment diametrically opposite to what ought to have been adopted, and which, when adopted, speedily cured the patient. This is a most important affection in the puerperal state, and should, even when attended by no other manifest disorder, receive constant attention, and suggest the most decided and appropriate means of cure—appropriate, however, to the various circumstances which occasion it, to the several associations in which it is presented to us, and to the maladies of which it is either the precursor or the attendant.

27. Insomnia is sometimes met with in *young and even in older children:* in them it should be viewed either as the precursor of serious disease, or as caused by some latent or undeveloped morbid condition. It not infrequently precedes or attends disease of the membranes or substance of the brain, especially tubercular deposits in the former, or softening of the latter, before serous effusions take place to any considerable amount; or it accompanies the earlier and more latent stages of these lesions.

28. iii. *The treatment of insomnia* should be altogether based upon those *indications of cure* which the disease of which insomnia is symptomatic, or of which it is the precursor, should rationally suggest. It is owing chiefly to a neglect of this principle that means, directed more particularly to this symptom, either fail of producing their intended effects, or even often greatly aggravate this particular disorder. In all cases of insomnia, attention should be directed to the age, temperament, habit of body, modes of life, and diathesis or morbid tendencies of the patient, before measures should be prescribed for the disorder, and these measures ought to be especially devised against the disease on which the wakefulness depends. A principal indication is to remove the several causes, remote, external, physical, and pathological, which occasion it, more particularly to correct a close or contaminated air; to reduce the temperature of the apartment when it is high, and the quantity or warmth of the bed-clothes; to remove all the excitants of the senses; to abstract the mind from all exciting, harassing, or engaging thoughts, and to direct it to such as are uninteresting or unexciting —to one simple, unimportant topic; and to remove or counteract the morbid conditions, of which this is a symptom or prominent consequence. In both young and aged subjects, but especially in the dyspeptic and gouty, the accumulations of disordered secretions and excretions — of fæcal or contaminating matters — of flatus, of acid or saburral materials—or a loaded state of the stomach or bowels, are apt to take place, and require free evacuation and correction

by laxatives, conjoined with antacids and absorbents. The existence of a plethoric state of the vascular system, or of engorgement of the liver and portal system, should suggest a repeated recourse to purgatives, deobstruents, and alkaline preparations.

29. When there is actual fulness of the cerebral vessels, or cerebral congestion, then local vascular depletions, purgatives, derivatives, the shower-bath, warm stimulating pediluvia, &c., should be prescribed; and, if the insomnia appears to be caused by increased vascular action, or by febrile disturbance towards night, or by augmented determination of blood to the brain, antimonial preparations, or other diaphoretics, conjoined with alkalies, &c., will generally procure sleep, while narcotics, exhibited in such cases, would only aggravate the disorder, induce headache, and increase disorder of the digestive functions.

30. Anodynes and narcotics should not be exhibited in cases of either incomplete or prolonged wakefulness, until general plethora or local congestions be removed by the means now suggested—until morbid secretions, excretions, and fæcal accumulations have been completely evacuated. But they are important means after these ends have been attained, and when this disorder occurs in nervous, hysterical, or irritable temperaments; when it follows copious losses of blood, or exhausting discharges, and when it is thus met with in the puerperal state. In these circumstances, the choice of the agent should depend upon the peculiarities of the case, upon the existence or non-existence of anæmia, and upon the evidence as to the purity or richness of the blood, and as to the actions of the several emunctories. When there is anæmia, or great debility or nervous susceptibility, the preparations of opium, or of hop, or of henbane, or of poppy, with those of iron, or the vegetable bitters and the alkaline sub-carbonates, will generally be of service; but all narcotics in such cases should be given two or three hours before the desired period of their operation, more particularly opiates; and, in order to secure their effects, and to prevent headache, sickness, or other disorder in the morning, they should be combined with aromatics and alkalies. In some cases, it may be preferable to administer the narcotic in a suitable enema or suppository; or the odour of it may be inhaled during respiration, by lying with the head on a pillow containing a narcotic substance, as hops, &c.

31. When sleep is disturbed by cramps, nightmare, frightful dreams, &c., the bed should be elevated towards the head, and acidity of the prima via and costiveness ought to be prevented by magnesia, either alone or with sulphur, or with an antimonial preparation; and food should not be taken for several hours before retiring to rest. Persons who are subject to partial wakefulness, or to troublesome dreams, or to sleep-walking, should be submitted to the curative means now advised, adapting these, however, to the peculiarities of each case. Due exercise in the open air, attention to the digestive functions, and a common-sense regulation of the moral manifestations and physical powers, will generally aid the effects of appropriate medical treatment. In all cases, the use of substances or beverages which are liable to disturb the digestive functions, to occasion heartburn or flatulence, or to excite the nervous system, more especially during the advanced hours of the afternoon or evening, the reading of exciting writings late in the evening, and reading in bed, more particularly, should be avoided; and, if wakefulness or disturbed sleep occur in persons who are addicted to these practices, it should, in great measure at least, be attributed to them, and the relinquishment of them ought to be insisted on.

[*Incubus*, or *Nightmare*, deserves mention in connexion with sleep. It is an affection so distressing, and yet so obscure in its nature, its pathology so little understood, that, though passed over in silence by most writers on practical medicine, it is worthy of special consideration.

History.—By some writers *incubus* has been confounded with other nervous diseases, and regarded, as by GALEN, as a form of *epilepsy*. By many of the ancients, however, it was attributed to the visitation of an *evil spirit*, or to satyrs and fairies: hence its name, *Incubus*. The idea that it was owing to demons, witches, and evil influences, prevailed down to a late period; and in our own country, especially in its early history, the victims of nightmare were supposed to be possessed or bewitched, and hence relief was only sought through the mystic rites of witchcraft.

Symptoms.—*Incubus* is characterized by an oppressive sense of suffocation in the præcordia and chest, coming on during sleep, continuing only for a short time, and which is completely overcome by a few deep inspirations. If the disease attacks during profound sleep, the powers of articulation and voluntary motion are often completely annihilated, and the individual is impressed with the image or idea of some object compressing his chest. There are, however, many variations in the mode of attack, according to its violence and the condition of the individual at the time, although, in every form, it is attended with the most horrible or painful sensations. A person may retire to bed apparently in perfect health; after a while, perhaps, he dreams, and experiences variable sensations, which, however, are all dispelled by the consciousness that he is in bed. All of a sudden he experiences a heavy weight on his breast, creating an urgent sense of suffocation, and, vainly endeavouring to remove it, he attempts to cry out, but his voice fails; he makes an effort to move, but not a fibre of his muscles yields obedience to the calls of volition. The feeling of suffocation increases every minute, and the condition of the individual is rendered more distressing by the delusion that takes possession of his dream—that a giant, an old hag, a dog, a bear, &c., is mounted upon his breast, and is the cause of his distress. The difficulty of respiration constantly increases, and, after repeated efforts to speak, he finally succeeds in giving utterance to slight, deep groans, which call the attention of other individuals, or he is awakened by the sound of his own voice, together with his feelings of extreme suffering. With the first deep and free inspiration every sense of suffocation and uneasiness is removed, the patient falls into tranquil slumbers, and awakes in the morning refreshed and invigorated, and without any unpleasant sensation remaining. The only reminiscence he retains of the events of the night is the image of the illusory object which pressed him in his sleep, and this, with the very credulous, is often magnified into the importance of a real phantom. Such are the usual phenomena

of a mild attack. In severe cases the sufferings of the individual are much more distressing. The attack may come on soon after closing his eyes in sleep, with slight spasms in the upper or lower extremities, a more or less intense constriction about the neck, and shocks, like those of electricity, through the body; the epigastrium is tender and sensitive to the touch, the pulse small, irritated, and jerking, the respiration impeded by the apparent existence of some obstacle to the ready descent of the diaphragm during the act of inspiration. The lungs, consequently, are not fully distended with air, and the patient makes repeated efforts to inspire more freely, which only tend to increase the præcordial distension. At length the patient starts suddenly with a loud cry, feeling that the sense of suffocation can only be overcome by a full and deep inspiration. Often there is a sensation of wind ascending from the stomach, and diffusing itself through the chest, a cold sweat breaks out upon the head and chest, and the sufferings of the patient are very great. In some individuals there may be several attacks during the same night, alternating with violent cramps and spasms. Tranquil and refreshing sleep only occurs after the development of a gurgling noise about the pylorus, which is followed by a subsidence of the feeling of distension and suffocation. The sleep is not often disturbed after the occurrence of these changes, and, if nothing should happen to awaken the individual, his subsequent sleep is rarely broken by a renewal of the distressing symptoms which had harassed him in the first part of the night. In this more aggravated form of incubus the unfortunate sufferer is seldom allowed respite for a single night, and even during the day, and when fully awake, he frequently experiences attacks of spasm, embarrassed breathing, and oppression about the præcordia, which are of short duration. There are other symptoms, which occasionally occur, as a kind of *aura*, diffusing itself from the chest to the brain, giving rise to an impairment of the sensorial function, and threatening even an attack of apoplexy. Free eructations of air from the stomach, with full inspirations, generally afford instantaneous relief.

Those who are affected with incubus in a severe form suffer during the day, and while they are awake at night, with the spasmodic and other unpleasant sensations which forebode an attack of the disease. The individual sometimes experiences the feeling of a current of cold air ascending from the stomach to the head; he is unable to cry out, and, in order to prevent himself from falling prostrate, he seizes upon the nearest object at hand. A deep inspiration is generally sufficient to dispel the unpleasant sensation, but very often the accessions are repeated from four to six times in the course of an hour, and with each renewal of the attack the symptoms of apoplexy and sudden death become more urgent. In some cases patients complain of great palpitation of the heart, mental confusion immediately after waking, tremors of the limbs, roaring in the ears, oppression about the chest, &c.; and it is worthy of particular remark, that constipation of the bowels, an abnormal state of the alvine evacuations, disturbance of the digestive function, flatulence, &c., are almost constant attendants on the disease, and constitute leading conditions in its pathology. The most characteristic symptoms of the disease are the existence of peculiar phantasms or hallucinations, annihilation of voice and voluntary motion, and disturbance of respiration. It is an affection which it is generally believed can only occur during sleep, but yet there is every reason to believe that slighter forms of the same disease, attended with a sense of oppression and suffocation about the chest and præcordia, with confusion of intellect, may occur during the day, and which require for their relief deep and forcible inspirations, the upright posture, and exercise, such as walking, &c. Such cases are mentioned by GOOD, JOHNSON, SCHMIDT, DALLAS, RHODIUS, LOSS, SCHENCK, and others. Of course the phantoms and false perceptions can only occur during sleep, and they are not always present during attacks in that condition, and therefore not pathognomonic of the disease; nor are abolition of speech and voluntary motion constant symptoms, though generally present. Painful and *oppressed respiration* is, however, strictly pathognomonic, and has this peculiarity, that it seems to proceed from the præcordial region, and disappears almost instantly on waking, after free inspiration.

Causes.—These are such as impede respiration, as a constrained posture, a distended stomach, diseases of the heart, an attack of asthma—in short, anything which may prevent due arterialization of the blood. During our waking hours such slight impediments to the respiratory process are easily obviated by our voluntary efforts, as change of posture, full inspirations, eructations of gas, &c.; but during sleep these efforts are suspended, respiration is more limited, and, if impeded by any cause, as an accumulation of gas in the stomach or bowels, venous blood accumulates in the lungs and right side of the heart, with a feeling of oppression and suffocation, which increases to that degree as to become almost insupportable, and, by breaking the spell of sleep, the individual is enabled to make those voluntary efforts which will result in due oxygenation of the blood and relief of the bodily functions. DR. STRAHL thinks that the alimentary canal, before the attack, becomes spasmodically closed at some point, so as to intercept the passage of the flatus downward, while the stomach is preternaturally distended, thus preventing the free motion of the diaphragm in inspiration, and the inflation of the lungs. He also supposes that the gaseous accumulation in the stomach rises upward into the œsophagus, forcibly distending it, and compressing the trachea. It is this that causes the individual to cry out, to seek the erect posture, and make an effort of deglutition to force the air downward into the stomach, or throw it off by free eructations, by which the symptoms are instantaneously removed: thus showing that there is a strong analogy between *globus hystericus* and *incubus*—the choking sensation in both cases being owing to the same cause, and relieved in the same manner.

Other pathologists, however, regard the accumulation of air in the stomach and bowels as an accidental concomitant rather than an essential element in the disease itself, and that the disease, in a majority of cases, occurs independent of such gaseous accumulation. By these writers it is attributed to irritation, or some perverted action of the pneumogastric nerve, which extends its influence to the organs of respiration and cir-

culation, as well as to the brain, and thus gives rise to all the phenomena. *Incubus* may, therefore, be justly placed in contrast with somnambulism, in which the power of voluntary motion continues, while the external senses are either suspended, or their impressions superseded by some internal train of ideas that engrosses the mind.

Treatment.—This must be directed to a correction and removal of the various causes of the disease. Exercise, and a regulated, simple diet are often all that will be required for its cure. Crude and indigestible substances are wholly to be avoided, while the symptoms of acidity and flatulence are to be temporarily relieved in the usual way, by magnesia, alkalies, or ether. The exalted sensibility of the ganglionic nerves, if such exists, must be allayed by appropriate means, and the distension of the alimentary canal by flatus guarded against. In most cases there exists great torpor of the skin, and it is of the first importance that this should be obviated by frequent friction, baths, &c.; a weak infusion of warm chamomile tea, taken on going to bed, will generally prevent an attack in those predisposed to the disease. Frictions over the region of the pylorus with the hand, warmth to the abdomen, warm baths, stimulating enemata, &c., have also been recommended. Any hope of permanent cure, however, must, as in most other chronic ailments, be founded rather on hygienic than pharmaceutical remedies.]

Bibliog. and Refer.—*Hippocrates*, Περὶ ἐνυπνίων, Op., p. 375.—*Galenus*, De Dignotione ex Insomniis, op., t. iv.—*Avicenna*, Canon., l. 1, fen. 2, doct. 2, cap. 13.—*H. Cardanus*, Somniorum Synesiorum omnis Generis Insomnia explicantes, l. iv., 4to. Basil., 1585.—*J. Horstius*, De Natura, Differentiis et Causis eorum qui Dormientes ambulant, &c., 8vo. Leips., 1593, vide *Haller*, Biblioth. Med. Pract., vol. ii., p. 216.—*T. Zwinger*, Tabulæ in Hippocratem de Insomniis, v. Comm. xxii., fol. Basil., 1579.—*Labbè*, Ergo pejor Vigiliarum quam Somni Excessus. Paris, 1692.—*Zacutus Lusitanus*, Med. Pract. Hist., l. i., n. 15.—*Hoffmann*, De Somnambulis. Hal., 1695, Opera Suppl., ii., 2, p. 230.—*J. C. Scaliger*, Comment. in Hippocratem de Insomniis, 12mo. Amst., 1659.—*Rousseus*, Epist. Med., No. xix. (*De Somno Meridiano*).—*Levada*, In Mém. de la Société des Sciences Physiques de Lausanne, vol. iii., No. xix. (*Somnambulism from injury on the head*).—*Autenrieth*, Physiologie, § 1033.—*J. Cheyne*, Cyclopæd. of Pract. Med., vol. iv., 449.—*R. Macnish*, Philosophy of Sleep, 24mo. 1845.—*E. Binns*, Anatomy of Sleep, 2d edit., 12mo. 1845.—*W. Philip*, Inquiry into the Nature of Sleep and Death, 8vo. 1834.—*Wienholt*, Lectures on Somnambulism, translated by Colquhoun, 8vo. 1845.—*J. Braid*, Neurypnology, or the Rationale of Nervous Sleep, 8vo. 1845.

[Am. Bibliog. and Refer.—See Der Alp. Sein Wesen und Seine Heilung. Eine Monographie, *Von Moritz Strahl*, &c., p. 253, 8vo. Berlin, 1833.—Dr. *C. J. B. Williams*, in Cyclopedia of Prac. Med. Phil., Lea & Blanchard, 1845, vol. ii. Notices of the disease will be found in the works of *Hippocrates*, *Galen*, *Dioscorides*, *Cœlius Aurelianus*, *Paulus Ægineta*, *Forestus*, *Benedictus Faventinus*, *Oribasius*, *Ætius*, *Wierius*, *Vesalius*, *Sylvius*, *Sinnertus*, *Zacutus Lusitanus*, *Waller*, *Doney*, *Adler*, *Walter*, *Simpson*, *Dallas*, *Schmidt*, *Rhodius*, *Johnson*, *Schenck*, *Loos*, *Good*, *Greckling*, *Hagedorn*, *Gremb*, *Bonetus*, *Highmore*, *Etmuller*, *Morgagni*, *Haller*, and others.]

SMALL-POX. — Synon. — *Euphlogia*, Rhazes. *Variola*, Sydenham, Boerhaave, Sauvages, &c. *Pestis variolosa*; *Febris variolosa*, Hoffmann, Vogel, &c. *Synochus Variola*, Young. *Synochus variolosus*, Crichton. *Emphysesis Variola*, Good. *Petite Vérole*, Fr. *Pocken*, *Blattern*, *Kinderblattern*, *Kindspocken*, Germ. *Vajuolo*, Ital. *Viruela*, Span. *The Pox*, Scot. *Small-pox*, Engl.

Classif.—1st Class, Febrile Diseases. 3d *Order*, Eruptive Fevers (*Cullen*). 3d Class, Diseases of the Sanguineous Function. 3d *Order*, Eruptive Fevers (*Good*). III. Class, III. Order (*Author in Preface*).

1. Definit. — *Small-pox is the product, and is productive of a morbid poison or miasm, which, after a period, develops fever, followed by an eruption on the surface of the body, passing through the stages of pimple, vesicle, pustule, and scab, with other concomitant or succeeding affections; the disease running a determinate course, leaving marks in the seats of eruption, and removing from the constitution the susceptibility of another attack.*

2. I. Historical Sketch.—The term *variola* is probably of monkish origin, it being the diminutive of *varus*, a pimple. The term *pock* is of Saxon origin, and signifies a bag or pouch. The epithets *petite* in France, and *small* in England, were added soon after the appearance of syphilis, or the grand or great pox, in Europe, in 1498. In Scotland the word pox is still used without the prefix.

3. Dr. Hahn endeavoured to prove, early in the last century, that the Greeks and Romans were acquainted with small-pox; and, much more recently, Dr. Willan and Dr. Baron have followed in the same track. Rhazes, who was the first accurately to describe this malady, was also the first to refer to the writings of Galen in proof of its having been known to the Greeks; but, as Dr. Greenhill has shown, in his able notes to his admirable translation of Rhazes, the ἰονθος of Galen was not small-pox, but the *acne* of modern authors. Mr. Moore has striven to show that small-pox was known in China and Hindostan, even before the time of Hippocrates. Dr. Gregory remarks, that he is incredulous of this having been the fact, and that he "is borne out in this skepticism by the opinions of Dr. Friend, Dr. Mead, and many other physicians of great learning, and equally indefatigable in research." It is not, however, improbable that the disease may have appeared or prevailed in China and other adjoining countries very long before it was known in Arabia or Syria, and that it may have taken even a much longer period to have extended from the former to the latter countries than it took to reach the western parts of Europe.

4. That small-pox was not known to either Greek or Arabian writers early in the 6th century, is manifest from the circumstance of no mention having been made of it in the work of Alexander Trallianus, in which all the diseases then known are briefly described. Dr. Gregory, in his very excellent work on "Eruptive Fevers," remarks, that "the first notice of a disease which looks like small-pox is to be found in a chapter of Procopius, 'De Bello Persico' (lib. ii., c. 22), where he describes a dreadful pestilence which began at Pelusium, in Egypt, about the year 544." But I cannot agree with this view; for Procopius states that malady to have been attended by buboes and carbuncles, which, with the other particulars mentioned by him, point rather to the plague than to small-pox. Dr. Gregory, however, adds, that whether this "disease was small-pox or not, may be doubted; but certainly within a short time afterward very unequivocal traces of small-pox are to be met with in the countries bordering on the Red Sea, for we read of caliphs and caliph's daughters being pitted."—(*Op. cit.*, p. 35.)

5. It cannot be doubted that small-pox had prevailed and been well known in Arabian and adjoining countries, and even in the western parts of Europe, some centuries before Rhazes described it at the commencement of the 10th century; and probably it was even much earlier known in China, or in some eastern countries, than in these. Mr. Bruce, the celebrated traveller, believed that the first epidemic of small-pox of which any notice can be found occurred in 522. Mead says that, according to an Arabian manuscript, in the library of Leyden, this malady appeared for the first time in 572, the year of the birth of Mohammed, in Arabia, where it was introduced by an Abyssinian army. Marius, bishop of Avenches, remarks, in the second volume of his "*Historia Francorum Scriptorum*," &c., that it existed in Europe two years before this date, and that it ravaged France and Italy. Marius, who sat in the second council of Maçon, held in 585, states positively, in his chronicle, that in 570, "*morbus validus cum profluvio ventris et variolis, Italiam Galliamque valde afflixit;*" that it ceased for some years, and reappeared in 580 in the same form as in 570. He adds, that Dagobert and Clodobert, sons of King Chilperic and Fredegonda, died of this malady; that the wife of Gontran, king of Burgundy, was also attacked in 580, and that, feeling her dissolution near, she accused her two physicians, Nicolas and Donat, of having poisoned her, and requested their execution, which was carried into effect over her tomb.

6. M. Monfalcon states that Ahron, a physician of Alexandria, at the commencement of the 7th century, first mentioned the symptoms, the different varieties, and the treatment of small-pox; and that in 640, during the reign of the caliph Omar, when the irruption of the Arabs or Saracens into Egypt took place, the disease appeared in so destructive a manner as to lead many contemporary writers to suppose that it was a new pestilence. It appears to have extended during the 7th century to all the countries whither the Saracenic conquerors carried their arms.

7. Although Rhazes was the first to write expressly and fully on small-pox, he does not pretend to have been the first who had noticed it, for he gives extracts from the works of Ahron, the elder Mesue, and the elder Serapion, in which mention is made of it. This malady was afterward noticed by Avicenna, Hali-Abbas, and other Arabian authors. It appears to have reached England towards the close of the 9th century, or even earlier. After or during the Crusades, the spread of the malady appeared more extended. It then prevailed in most of the temperate countries of Europe. Bernard Gordon, professor of medicine at Montpellier, in 1285, notices the frequency and fatality of the disease in France at that time; but it does not appear to have been so early known in Norway, Lapland, and other very northern countries; the coldness and dryness of the air probably retarding its progress to them. Dr. Gregory states that the word Variola is to be found in several Latin manuscripts in the British Museum of dates decidedly prior to 900. It should not be overlooked that the contagious nature of small-pox was admitted by all the Arabian and other early writers.

8. From Europe, small-pox was carried across the Atlantic to Mexico, which it devastated in 1527, and spread from thence, with fearful virulence, throughout the American continent. The ravages of small-pox were especially great within the tropics, and still are most remarkably so in the dark-skinned races, as sufficiently demonstrated to my own observation. From the earliest notices of the malady, until the appearance of the writings of Sydenham, there is little to mention in the history of its progress, prevalences, or treatment, farther than that it was the most generally diffused, the most frequently epidemic, the most fatal, and the worst treated of all known pestilences. The heating or sweating regimen had gradually reached its acme when Sydenham appeared. He not only accurately described this disease, but distinguished it from measles, and reformed the treatment of it. Boerhaave and Van Swieten adopted and carried out the views of Sydenham, and demonstrated the extension of the malady by means of a specific miasm or virus alone.

9. The *inoculation*, or artificial production, of the disease was then only brought into notice in Europe, although it had been practised in various countries for ages previously. We have no information as to the period when this resource was first adopted, or as to the circumstances which suggested it. It is by no means improbable that the well-known contagious nature of small-pox, the greater severity of the disease in childhood and infancy than in adult age, the admitted liability of all to be infected, the immunity from a second attack, and the desire generally felt of having what was inevitable undergone as early in life as possible, may have suggested to those exercising the healing art the experiment of artificially communicating the disease, when prevailing in a mild form, to children and those exposed to its infection, in order to secure an immunity from it in after life; and it is equally probable that those considerations influenced many in more countries than one, and at different eras. The obvious advantages which resulted must have led to the diffusion and the continuance of the practice. Voltaire, writing as early as 1727 in favour of inoculation, remarks, that the females of Circassia and Georgia were, from times immemorial, in the habit of communicating the small-pox to their children at as early an age as six months, by making an incision in the arm, and by inserting in this incision the contents of a pustule taken from another child. M. Monfalcon states, that inoculation was practised from remote antiquity in Africa, especially on the coasts of Barbary, in China, Hindostan, Egypt, Armenia, Tartary, in Greece, and even in Wales and some parts of the west of England, and in Auvergne and Perigord in France. He does not, however, give the authorities for this statement. Bartholin, who wrote about the middle of the 17th century, states that inoculation had been long used in some parts of Denmark. Monfalcon remarks, that it was employed for the first time in Constantinople in 1673, and Bruce, the celebrated traveller, says that it had been practised for ages in Nubia. Dr. E. Timoni, Mr. Kennedy, and Dr. Pylarini, in 1714 and 1715, made the profession in England acquainted with it, but no attention was paid to it until Lady Mary Wortley Montague had her son inoculated at Constantinople in 1717, and her daughter in 1721 in England. After successful trials upon six condemned criminals in Newgate, the Princess of Wales submitted successfully her

own daughters to the new process in 1722. Voltaire, in 1727, was the first writer in France to direct popular opinion in favour of inoculation. His observations on the subject may even now be read with interest. He remarks, that most of the 20,000 who died of small-pox in Paris in 1720 would have been saved if ineculation had been then introduced.

[The practice of inoculation was introduced into the United States as early as the year 1721. Dr. William Douglass, of Boston, in his "*Practical Essay concerning the Small-pox*" (1730, p. 38), remarks, that "The Circassian method of procuring the small-pox by *variolous pus*, applied externally to fresh cutaneous incisions, lately introduced in Great Britain and New England, seems to bid fair to alleviate the crisis as to the quantity and deleterious nature of the inflammations and suppurations; but it is not an absolute certain remedy against a bad sort. Much of the same nature is what Dr. Williams says has been an immemorial custom in some parts of Wales, called *buying of the small-pox*: the person procures a few fresh pocky scabs, and holds them in the hollow of the hand a considerable time; about ten or twelve days thereafter the person sickens, &c." In another tract, by Dr. Nathaniel Williams, of Boston (Boston, 1752), are contained particular directions for the practice of inoculation, and he states that fifty out of sixty-five whom he inoculated were sitting up and walking about soon after the eruption appeared; and that but a single patient, a child of eight weeks, died, of all whom he inoculated.]

10. The first ten years of the career of inoculation in this country, Dr. Gregory observes, were singularly unfortunate. It fell into bad hands; it was tried on the worst possible subjects, and practised in the most injudicious manner. The consequence was that it soon fell into disrepute. The pulpit, too, sounded the alarm; and, conducted as inoculation then was, it was a questionable improvement. A new era in this practice arose in 1746. The Small-pox Hospital was founded for the extension of inoculation among the poor. In 1754, the College of Physicians put forth a strong recommendation of the practice, and Mead and De la Condamine wrote treatises in favour of it. In 1763, the practice was especially adopted by Mr. R. Sutton and his two sons, who inoculated with great skill and success. "In 1775, a dispensary was opened in London for the gratuitous inoculation of the poor at their own houses; but the institution failed, chiefly through the opposition of Mr. Dimsdale, who had succeeded the Suttons, and fully equalled them in popularity and success. The Small-pox Hospital then took up the plan of promiscuous inoculation, which was carried on to an immense extent between the years 1790 and 1800. In 1798, Dr. Jenner announced the discovery of vaccination. In May, 1808, the inoculation of out-patients was discontinued at the Small-pox Hospital. In June, 1822, inoculation was discontinued to in-patients. On the 23d July, 1840, the practice of inoculation, the introduction of which has conferred immortality on the name of Lady Mary W. Montague, which had been sanctioned by the College of Physicians, which had saved the lives of many thousands during the greater part of the preceding century, was declared illegal by the English Parliament. All offenders were to be sent to prison; and it was even provided that any attempt to produce small-pox by inoculation, even though unsuccessful, including, of course, the testing of vaccinated subjects, was an offence at law.—(*Op. cit.*, p. 39.)

11. II. Description of Natural Small-pox.—This malady presents several forms, depending chiefly on its grades of severity, these grades arising from the intensity or concentration of the infecting miasm; from the susceptibility, constitution, or habit of body, of the person infected; and from the extent to which vital organs or surfaces are affected by the morbid actions developed by the morbific leaven. The state of the eruption more especially fixes our attention, inasmuch as it disorders the functions of an important organ, as it is a suppurative inflammation of a surface which induces serious sympathies in the economy, as it is an indication of the state and character of the vital powers, of the vascular action, and even of the blood itself, and as it most visibly and tangibly manifests the form or variety of the disease, suggesting not merely the diagnosis and prognosis, but also the indications of cure. As respects the *eruption*, therefore, it may be *distinct*, *corymbose*, *semi-confluent*, or *confluent*, according to the number, grouping, or distribution of the pustules; it may also be superficial, cellular, limited to the cutaneous surface, or extended more or less to the mucous membranes, especially at the outlets of canals; it may, moreover, be papular, vesicular, pustular, ichorous, scorbutic, or sanious, or purplish, or even blackish, according to the changes taking place in it. As regards the *type* or *character* of the attendant fever, small-pox may be *benignant*, *synochoid*, *petechial*, *malignant*, or *putro-adynamic*. It may also be *simple* throughout its course, and it may be more or less *complicated*, or associated with a prominent affection of one or more important internal parts or vital organs, developed during the progress of the malady. As will be rendered more apparent in the sequel, there is in general an intimate dependence of the state and appearance of the eruption upon the type and character of the fever, and of this latter upon the organic functions and the conditions of the blood. Whatever may be the form which the disease may assume, or however varied the associations of the states now enumerated may appear, small-pox presents certain stages which more particularly mark its course. These stages have been divided into, 1st, that of incubation; 2d, that of invasion; 3d, that of eruption; 4th, that of suppuration; and 5th, that of exsiccation. But some authors have distinguished only three, namely, 1st, incubation; 2d, maturation; and 3d, decline. The stages may be divided into, 1st, the *latent*, *precursory*, or *incubative*; 2d, the *febrile*, or *the primary fever*; 3d, the *period of eruption and development*; 4th, the *maturative* or *suppurative stage*, or the *period of secondary fever*, *desiccation*, *and decline*.

12. i. Distinct, Benign, or Simple Small-pox.—This form of the disease is very frequently met with in healthy constitutions, favoured by a pure air. It was that most frequently produced by inoculation, when this mode of communicating the disease was permitted. Between it, however, and the confluent no very precise demarcation can be assigned, as the corymbose and the semi-confluent are mere approaches to this more severe form. In the distinct or benign states of small-pox there is no serious depression of the vital power, or contamination of the fluids or sol-

ids, or dangerous affection of internal or vital organs, which more or less prominently mark the confluent and typhoid forms of the malady. The distinct small-pox presents in general the regular procession of the stages just distinguished.

13. *A. The period of latency or incubation*—the *precursory stage*—in small-pox, or the time which elapses from the inhalation of the infecting miasm, or the morbific leaven, until the appearance of the primary fever, has been ascertained with considerable precision on numerous occasions. In cases of inoculation the duration of the stage is rendered apparent; but in natural small-pox it is very commonly a matter of doubt. Dr. Gregory, who has directed his attention to this topic, states that a large accumulation of facts enables him to fix this period at about twelve days, and that the extremes may be stated at ten and sixteen days. It has been, however, contended by several writers that circumstances may occasion much longer or much shorter periods of incubation than are here assigned, and my own observation tends to confirm this opinion. A concentrated effluvium or miasm from the infected; a severe and prevalent epidemic; a very susceptible, weak, or cachectic habit of body; great fear of the disease, or dread of infection; a warm, humid, and close atmosphere; and the respiration of air loaded with emanations from a number of small-pox cases, may somewhat shorten this period, and hasten the next or eruptive. On the other hand, various circumstances may prolong this stage, and retard the appearance of the next, especially a weak dose of the poison; strong health and insusceptibility of the patient; a dry, cold, and pure state of the air, or residence in a dry and bracing locality. In the former circumstances, the period of incubation may possibly be shortened to seven or eight days, and in the latter it may be prolonged even to twenty or twenty-one days; but of these extreme ranges Dr. Gregory very strongly doubts, ten and sixteen days being the extremes, according to his observation. The inoculated disease furnishes a more determinate duration, which is generally from seven to nine days.

14. The first days of this period are often passed without much or obvious disorder; but in other cases some symptoms are experienced indicating a state of impaired health, especially languor, lassitude, or malaise. When the disease is infected by a miasm floating in the air, or emanating from the sick, the patient sometimes experiences, at the time, an unpleasant and peculiar odour, generally attended by a feeling of sickness, giddiness, and of impending disease. When this feeling is strong, it is often accompanied by a state of alarm or dread, which seems to shorten this stage and to hasten on the next, and even to render the malady more severe.

15. *B. The febrile stage, or that of invasion*—*the primary fever*—supervenes upon the preceding period; or from the ninth to the thirteenth day from the time of infection, or from the seventh or eighth day from inoculation, the patient experiences rigors, followed or attended by febrile symptoms, especially acceleration of pulse, heat of skin, pains in the loins and limbs, restlessness, scanty and high-coloured urine, nausea, vomiting, &c., &c. In some cases, the *rigors* and *heats* alternate for some time, or during the first day; but the latter generally soon follow on the former. On the second day the fever is attended by *nausea* and *vomiting*, and great depression, with tenderness at the epigastrium on pressure, and anxiety at the præcordia. The lassitude and torpor are often accompanied, in adults, with somnolency, headache, and sweats; and in children, with faintness, sinking, or even with convulsions, or eclampsia. *Pain* throughout the body, more especially in the head, back, loins, and limbs, is always experienced, and the pain at the epigastrium is often so severe as not to admit of the least pressure, or even the weight of the bedclothes. In some cases the headache is attended by stupor or delirium, especially in adults; and in children by sopor, or epileptic convulsions; in these, the face is hot and flushed, and the carotid and temporal arteries beat strongly, the *tout-ensemble* of the symptoms indicating great vascular reaction. Sydenham remarks, that when children, especially after dentition, are seized with convulsions during the primary fever it is a sign of the speedy appearance of the eruption; so that, supposing the convulsions to take place over night, a kindly small-pox may be expected to appear in the morning.

16. In other cases, excessive prostration, with faintness or syncope, extreme anxiety at the præcordia, oppression at the chest, frequent sighing, and even dyspnœa, pallid countenance, coldness of the extremities, and feeble pulse, usher in the febrile stage, and take the place of rigors or chills, or follow immediately upon them. These symptoms are indications of the depressing influence of the poisonous miasm on the organic functions, and of the inability of the vital energies to react sufficiently, or to develop a state of healthy action. In these cases, a confluent state of the disease, or marked adynamia may be expected, with pulmonary congestion, &c. One or other of the foregoing groups of symptoms generally usher in the eruptive fever, and although neither of them can be considered as evidence of the nature of the incipient malady, still, the previous good health of the patient, the suddenness or severity of the seizure, the prevalence of variola in the vicinity, or prior exposure to infection, even although vaccination or previous small-pox should have been undergone, ought to be viewed as very strong indications of the disease. Dr. Gregory justly remarks, that the fact of prior vaccination should not throw the physician off his guard, for the initiatory fever is just as severe after vaccination as it is in the unvaccinated.

17. *C. The Period of Eruption and Development.*—Forty-eight hours elapse from the rigors to the first appearance of eruption. The period is never less, but it may be protracted by weakness of constitution to seventy-two hours, and the full development of the eruption over the whole surface may even occupy three days. Generally, however, the eruption appears on the third or fourth day of the fever. During this fever, besides the more prominent symptoms above mentioned, stridor of the teeth in children, with sopor, is very common; and in adults, a peculiar and fetid odour, with sleeplessness, dryness of the fauces, and turbid state of the urine. The pulse is much increased in frequency, and is either soft, or broad and compressible. The febrile symptoms more or less abate in the morning, and increase towards evening.

18. Minute papulæ, sensibly elevated above the general surface or plane of the skin, show themselves, at first on the face, forehead, and

wrists, especially on the sides of the nose, upper lip, and chin; then on the neck and breast, and afterward, on the limbs and trunk. When the papulæ are numerous, their first appearance is attended by tension and slight pruritus; and, upon moving the fingers over the skin with some firmness, the papulæ are felt to be not merely superficial, but based in the cutis vera. The eruption rarely commences in the lower extremities. Sometimes two or three large papulæ precede the general eruption, and advance to the state of vesicle before the surface is extensively occupied. The papulæ are "generally not thrown together confusedly and without order, but are arranged in groups of three or five. Crescents and circles may be traced very distinctly, when the eruption is not too copious. This constitutes an important diagnostic between variola and varicella." In most cases, the eruption affords great relief to the general constitutional disturbance. The fever abates, the sickness subsides, and the pains of the head, loins, and limbs moderate, or altogether cease.

19. *The development* of the papulæ commences with the evolution of the eruption and the subsidence of the fever, which precedes and evolves the eruption. But during this period, although the fever abates more or less remarkably, especially in the benign or distinct form of the distemper, yet it rarely ceases altogether, or disappears without returning more or less slightly in the evening. When the eruption is abundant, or the temperament of the patient is irritable or sanguineous, the mitigation of the fever is less remarkable; and, if the eruption has been delayed, or is confluent, or if the disease be complicated by some internal congestion or prominent affection, the febrile action may be continued during the development and maturation of the eruption with but little abatement, and generally in a typhoid, adynamic, or even putro-adynamic form or type.

20. The number of the pustules vary according to the severity of the case—from three or four to some thousands, appearing first on the face, neck, and upper extremities, then on the trunk, and lastly on the lower extremities, and changing from the state of papulæ, or vari, to that of vesicle and of pustule in succession. When the eruption is fully out over the body, and the pustules on the face begin to maturate, or about the eighth day from the commencement of the eruptive fever, the whole face, head, and neck become somewhat swollen, particularly the eyelids, which are often so distended as to close the eyes; and the swollen parts are painful when touched, and even throb. This intumescence lasts about three days, the spaces between the pustules appearing inflamed, or of a deep red, or damask rose colour: the closer this resemblance, the milder, generally, is the subsequent disease. Nearly one fifth of the number of pustules appear on the face; and according to Sydenham, the danger is in proportion to the number of pustules on the face, those on the other parts of the body hardly influencing the event. This, however, is not altogether the case, for the danger chiefly arises from the *tertiary* effects of the poison, or those produced upon vital or internal parts; the *secondary* effects being the cutaneous eruption.

21. *D. The suppurative or maturative Stage—the Period of secondary Fever and Desiccation.*—With the intumescence of the face, the fever, which had remitted, returns, and the secondary fever commences. In cases of ordinary severity, the return of the fever is marked by a considerable increase of heat of surface, by a frequent pulse, and by slight delirium, from which the patient is easily roused. In favourable cases, the swelling of the face, the redness of the intervening spaces, and the secondary fever, having continued from the eighth to the eleventh day, subside, and the pustules, now fully ripe, burst and discharge a thin yellow matter, which concretes into crusts that fall off on the fourteenth or fifteenth day from the commencement of rigors, and the disease terminates, leaving the surface underneath the crusts depressed and of a pale lake colour. If the disease be of greater severity, hæmaturia, hæmoptysis, oppression in the chest, or a hard dry cough, may be complained of, with severe headache or pains in the loins or limbs, and more marked delirium, or even sopor; these more severe symptoms, however, generally subsiding on the eleventh or twelfth day.

22. When the symptoms assume an unfavourable aspect or threaten a fatal issue, then the face, which ought to have been intumescent on the eighth day, remains without any fulness or swelling; and the spaces between the pustules, instead of being red or inflamed, as seen in the favourable cases, are pale and white. Sydenham says that the pustules look red, and continue elevated even after death; and the sweat, which was free up to this day, suddenly ceases. At this critical period, the secondary fever, instead of presenting more or less of asthenic character, may assume either a typhoid or an asthenic or a sinking form. When the secondary fever presents a typhoid type, the tongue becomes brown and dry, the pulse very frequent, and delirium soon appears, and often quickly passes into sopor or coma. In the rapidly sinking form, the patient may appear as suddenly overwhelmed by the depressing influence of the morbid poison, the pulse being hardly increased in frequency, the heat of the body natural, and the intellect unimpaired. Dr. R. Williams remarks, that the first case he saw of this kind, he could not help assuring the patient "that his symptoms were favourable; but he shook his head, and, perhaps from an inward feeling that his fate was sealed, affirmed that to survive were impossible, and he died a few hours afterward."—(*On Morbid Poisons*, p. 228.) Such cases are, however, rare in the discrete small-pox, but they are much more frequent in the confluent (see § 33, *et seq.*), and result from the influence of the poisoned and contaminated blood on the organic nervous system and heart. These cases very closely resemble, in all respects excepting the eruption, the character and termination of the putro-adynamic form of *fever* (which see, § 472, *et seq.*).

23. In the more severe cases of the discrete or distinct small-pox, the morbid poison acts not only on the skin, but also on the mucous membrane of the eyes, throat, and mouth, occasioning an eruption, often somewhat pustular, in these parts. This additional affection does not appear to aggravate the fever, at least not materially, but it occasions more or less inconvenience. The eruption in the mouth and throat causes hoarseness, soreness of throat, and difficulty of swallowing. When the eruption extends to the conjunctiva or cornea, it is often not attended by much pain; but when the swelling of the eye-

lids has subsided, the extent of mischief which sometimes takes place, especially when the cornea is implicated, is then discovered. The mucous surfaces are, however, not so much or so generally affected in the discrete as in the confluent form of the distemper (§ 39, *et seq.*)

24. At this period a peculiar faint and sickly odour, particularly when the eruption is copious, emanates from the patient. Sometimes, especially in females and persons of a delicate and scrofulous habit of body, the secondary fever is accompanied with a very tender state of the general surface; but it is a very favourable sign. Recovery may be retarded by weakness of habit, by cold, and by the presence or development of the scrofulous taint. An ecthymatous eruption may also occupy the surface, or the skin may be left dry and scaly, or the scabs may be adherent. These phenomena are chiefly owing to the form of secondary fever, in connexion with the habit of body, &c.

25. *E. Of the Progress and Appearance of the discrete Eruption.*—The affection of the skin being generally present, while that of the mucous membranes is often wanting, especially in milder cases, the cutaneous eruption requires especial attention. The *eruption* runs a course of eleven or twelve days, in discrete small-pox, from the very first appearance of it until its termination; and, in its progress, is at first tubercular or papular, then vesicular, afterward pustular, and, lastly, it scabs and falls off. The first, or papular, lasts about two days; the second, or vesicular, occupies four days; the third, or pustular, or suppurative, lasts three days; and the desiccative lasts three days more. The form and progress of the eruption is different in the confluent, in the verrucose small-pox, and in variola after vaccination. The eruption at first consists of a number of minute pimples or papulæ, which feel like minute tubercles in the true skin, when the fingers glide firmly over the surface, and are about the size of a pin's head. They are more or less numerous, but distinct from one another, and hardly salient. On the third, or close of the second day, a minute vesicle forms on the apex of each pimple or papula, which, as it fills, is bound down or depressed in its centre, or umbilicated, and contains a clear whey-coloured fluid. On the approach of suppuration or maturation, the cuticle covering the vesicle loses its transparency, and becomes white and opaque. About the fourth or fifth day of the eruption, a red areola appears around the base of each vesicle, and, shortly afterward, the central *bride*, causing the umbilication of the vesicle, ruptures, and the vesicle becomes pustular, enlarges, and fills, and assumes a somewhat conical or acuminated form. From the fifth to the eighth day of the eruption, the pustule maturates, when the surface becomes rough and yellow, and the cuticle breaking, allows a portion of the contents to ooze out. In the interval from the eighth till the eleventh day, the pustule secretes the peculiar viscid matter which concretes and forms the scab. This scab desiccates, and is detached between the eleventh and fourteenth days, leaving the cutis, which it covered, of a reddish brown, which lasts many weeks; but if the pustule has so penetrated as to cause ulceration of the rete mucosum, it leaves a permanent depression or pit. The cicatrix which is formed after these burrowing pustules is usually white.

26. *F. The internal structure of the variolous pimple and pustule* has attracted the attention, first, of Cotugno in Italy, and afterward of John Hunter, Adams, Bousquet, Gendrin, Judd, Petzholdt, and others. Dr. Gregory has given the following account of the organization of the variolous pustule: "Inflammation begins at the spot called the phlyctidium. Its seat is in the cutis vera. From the central point, or stigma, the inflammatory action proceeds by radiation to the surface, penetrating to a greater or less depth in different cases. Beneath the epidermis, and constituting the greater part of the phlyctidium, is formed a substance or disc, of the consistence of pulp or thick mucus. This is not considered as any part of the skin altered by disease, but as a product of a specific action of the vessels. John Hunter and Adams called it the variolous slough. At the height of suppuration this substance is swollen, and moist like a sponge. The floor of each phlyctidium presents the papillated structure of the skin, elevated and marked with fissures. The vesicle is divided, like the substance of an orange or poppy-head, into numerous cells—twelve or more. It is multilocular. A filament of cellular tissue binds down the central portion of cuticle to the lower surface of the phlyctidium, and gives to the vesicle, in its early stages, that umbilicated form—that depression of its centre which, though not peculiar to the variolous eruption, is so striking a diagnostic mark between it and genuine varicella. The fluids, lymph and pus, which at different periods distend its cells, destroy at length the filamentous attachment of the stigma to the cuticle, and that which was at first a depressed or umbilicated vesicle becomes at last an acuminated pustule. It bursts, discharging a well-formed purulent matter, of a yellowish colour and creamy consistence."*

* The following descriptions farther illustrate this topic: Bousquet says that the pustule has its seat in the true skin, and that the epidermis is not thickened. On removing, however, the epidermis, which is easily detached, we discover a white, opaque, smooth surface, which is a layer of lymph deposited from its adherent surface, and, on removing this "disc," the interior of the pustule is seen divided by many concentric radii into a number of divisions or cells, each filled with fluid, but not communicating. This interior arrangement Bousquet compares to a cut orange or pomegranate, while Gendrin says it resembles that of a spice box. The depression at the centre on the *umbilication* is occasioned by a portion of cellular tissue which binds down the cuticle, and is slow to undergo the process of ramollissement by which it ultimately ruptures. The description of the pustule by Mr. Judd, who appears to have examined the formation of the small-pox pustule with great care, is, in some respects, different. For he states, "that in the small-pox pustule circles of vessels enlarge and project from the cutis vera, and they secrete a thin serum, which gradually raises a ring of the cuticula externa from the rete mucosum, and, distending it, forms a vesicle, without, except in some violent confluent cases, breaking up the attachment in the centre between the cutis rete and the cuticle. Hence the vesicle is bound down at that spot, and hence it has a depressed summit. The degree of inflammation suddenly increases, and a thick coagulable lymph is then thrown out that at once consolidates, and forms a thin flat plate like a cymbal, but with a small hole left through its centre, from the coagulation taking place around the before-mentioned thread-like attachment of the cuticle. Now, about the time when the fever and inflammation are again increased, called the secondary fever, and pus being secreted, it elevates the lately described cymbal or plate, and causes it to divide the pustule horizontally, into an upper and lower cell, and the progressive distension at times breaks up the remaining attachment between the cuticle and cutis. The pustules become opaque; for the pus passes through the hole in the plate, or septum, and blends with the lymph or serum above. The lower part of the pustule is completed by an extremely thickened state of the rete

27. The inflammation of the phlyctidium is attended by a specific or erythematous inflammation, called the areola, extending to some distance beyond the margin of the vesicle. The exact tint of this areola should always be carefully noted as indicative of important local and constitutional states. On the subsidence of this inflammatory areola, the ripened pustules, having burst and discharged their contents, are succeeded by scabs, which dry up and fall off, in a healthy constitution, in four or five days. In very mild cases, when the process of pustulation is not fully gone through, many of the vesicles shrivel, and form only imperfect, scaly crusts. On the lower extremities this premature desiccation of the vesicles is often very general.

28. In severe cases, the inflammation of the corion does not cease with the completion of the pustulating process. Portions of the cutis vera are then actually destroyed and slough away, the skin presenting the appearance of pits or fossæ, with a clarety hue, when cicatrization is at length completed. The dark tint wears off in the course of three or four months, but the depressions are permanent. From the great vascularity of the face, and from the exposure of it to light and air during the progress of the eruption, there is always a more severe effect and disfigurement produced by the disease in this situation than in any other part of the surface of the body.

29. ii. Modifications or Discrete or Benign Small-pox.—*A. Verrucose Small-pox—Variola verrucosa. — V. cornea — Horn-pock, &c.* This mild, mitigated, or modified form was well described by Van Swieten. Its symptoms are similar to those of the preceding form, but are much milder. The primary fever is often little more than a febricula, and the pustules seldom exceed one or two hundred. These, indeed, seldom reach a pustular state, but, having passed through that of tubercle or papula into that of vesicle, on the sixth day, or even sooner, desiccate, shrivel up, and crust. This form is so mild, that the secondary fever is not manifested and consequently is wanting, convalescence commencing on the eighth day of the eruption.

30. *B. Variola discreta siliquosa.*—When there are empty vesicles between the pustular pimples, or when the pus of the pustular pimples has been absorbed, so that they are left empty, the disease has been named *discrete siliquose small-pox.* When the eruption continues *vesicular*, instead of being pustular, the disease has been called *discrete crystalline small-pox.* When vesicular pimples appear in the interstices between the pustules, this modification has been named *discrete vesicular small-pox.* In these varieties the symptoms are generally mild, the eruptive fever generally slight or moderate, and the secondary fever is either wanting or mild; the duration of the disease being rarely prolonged, but often somewhat shortened.*

31. *C. Small-pox without the Eruption.—Variola sine Eruptione.*—Variola presents, in the more severe cases, the fever, the cutaneous eruption, the affection of the mucous membranes, and the internal complications, hereafter to be described. In the more mild or benign cases, it consists only of the fever and the eruption; but in both classes of cases there is a *primary* and *secondary* fever. In small-pox the fever is remarkable, and distinguished from all other fevers by its remission at the end of four days, or when the eruption has come out, and by its return after a remission of four days, or about the end of the eighth day in the discrete, and about the eleventh day in the confluent small-pox. But cases sometimes occur, especially where the pustules are few, or their maturation is rapid or abridged, in which the secondary fever is either very slight or altogether wanting; and other cases are met with, much more rarely, where neither the eruption nor the secondary fever is detected; and yet there can be no doubt of infection having taken place, and of the system being protected from another attack. In those, however, the primary fever has taken place, but without inducing the usual eruption. Sydenham, Lentin, Pelargus, Dubousis, Du Bourg, Frank, and others have observed, during the epidemic prevalence of small-pox, that some few persons who have not previously had the disease, nor been vaccinated, have been seized with all the symptoms of the primary variolous fever, and which having subsided without any eruption having appeared, they have afterward been found unsusceptible of the disease.

32. Sydenham, De Violante, Crosse, and some other writers above referred to, have remarked that cases have occurred, during the periods when small-pox was raging, which have been attended by petechiæ, bloody urine, or by purple spots and low fever, and have terminated fatally. These cases were viewed by them as small-pox without the eruption, the severity of the internal complication, or the state of the habit of body and of constitutional powers, preventing the due and regular evolution of the disease on the surface. It is by no means unreasonable to suppose that analogous phenomena to those which I have described in respect of *scarlet fever* (see that disease, § 26, *et seq.*) may also occur during the prevalence of epidemic small-pox, and that, owing to a predominant affection of the kidneys, or to depressed vital power, the eruption is either not developed on the surface, or very imperfectly, or in such manner as remarked by these and other writers. In cases where the kidneys are thus severely and early implicated, especially so as to arrest their excreting functions, not only are the usual phenomena and progress of the distemper interrupted, but a fatal issue soon takes place.

33. iii. Symptoms of Confluent Small-pox.—This state of the distemper commences generally with symptoms similar to those of the dis-

mucosum, which forms a raised lip or cup around; and, in most instances, the pustule may be stripped off with the cuticle and rete, still leaving the cutis entire. But the cutis vera has frequently a slight depression left from ulceration at the base of the cup, and occasionally a papule of the cutis projects into its centre, to which the band of attachment from the cuticle still adheres.

"After the incrustation has separated, and the eruption is gone, a stain, with a depression, is commonly left in the centre of the rete mucosum, occasioned by a zone of red vessels remaining long distended, both in the Ethiopian and in the European. In the former it is black and permanent, except when the cutis vera has been penetrated; while in the latter the marks are red and transitory, unless, indeed, when ulceration has penetrated the cutis, in which case, in them, also, the pits are white and permanent in the European."

* [This form of small-pox occasionally occurs in an epidemic form, mixed with the ordinary form of the disease, and even confluent cases, and is not unfrequently mistaken for chicken-pox. The character of the eruption, however, is very various, assuming in different cases almost every form of cutaneous disease. As they may be all traced to variolous infection, there can be no doubt of their being cases of modified small-pox.]

tinct variola, but more severe. The primary fever is usually attended by more sickness and vomiting; by severe pain in the loins, head, and limbs; by greater heat of surface; by more considerable and continued delirium; and in children, especially in the evening, or just before the eruption, by eclampsia or convulsions. The fever is not only more intense than in the discrete variola, but it is also of shorter duration, the eruption appearing somewhat earlier, or generally on the third day, sometimes at the end of forty-eight hours from the rigors, but rarely later than the third day. The sooner the eruption appears, the more confluent, generally, does it become. Sometimes it is preceded by extensive erythematous inflammation, and the papulæ come out irregularly, or in small clusters, or resemble the measles, and are more prominent than in the distinct variola.

34. The eruption is followed by a less complete remission of the primary fever than in the discrete small-pox, the pulse continuing frequent and soft, the tongue white, and the skin more or less hot, especially in the evening or night, when also delirium often occurs. Salivation, which seldom is seen in the distinct, excepting in the more severe cases of that form, very generally occurs in the third stage of the confluent distemper—during the period of development, beginning either with the eruption or a day or two afterward. The salivary discharge is at first thin and abundant, resembling that produced by mercury; but it becomes thick and viscid about the eighth day of the eruption, and, in very severe cases, it either ceases for a day or two and then returns, or it disappears altogether. Adults are more liable to salivation than children; but diarrhœa more frequently occurs in the latter, and often becomes profuse, or continues during the disease. The eruption is more or less modified in the confluent distemper; for the pustules, especially those on the face, do not rise, and are more irregular and flatter in their forms than in the discrete form. Owing to their greater number and contiguity, they run into each other and become confluent; sometimes forming irregular blisters or bullæ, varying from the diameter of a fourpence or sixpence to that of a half crown.

35. These symptoms may not vary materially until the eighth day of the eruption, or eleventh of the fever, when the stage of secondary fever commences, and greatly increases the severity of symptoms and danger of the malady. Previous to this period, the confluent malady seldom endangers life, unless hæmaturia, or suppression of urine, or hæmoptoë, or congestive pneumonia, or general bronchitis, &c., supervene, or the character of the pustules, or other signs, indicates a very contaminated state of the circulation. On and after the eleventh day, especially on that day, and on the fourteenth, the seventeenth, or the twenty-first day, according to Sydenham and R. Williams, the patient is often brought to such an extremity, that it is equally uncertain whether he may live or die. He is first endangered on the eleventh day by a high fever, attended by great restlessness or delirium, or by other symptoms, which usually prove fatal, unless controlled or prevented by treatment. If he outlive this day, the fourteenth and seventeenth are to be dreaded, for distressing restlessness, with more or less of the unfavourable symptoms about to be noticed, are liable to come on, or to become aggravated, between the eleventh and fourteenth days, and to place him in the most imminent jeopardy.

36. The most dangerous symptoms in the advanced stage of the distemper, or appearing with or during the secondary fever, are, the absence of the usual redness in the intermediate spaces; the non-intumescence of the face; the distribution of petechiæ in the interstices, or a black spot, hardly so large as a pin's head, in the centre of each pustule, or the partial filling of the pustules with a dark ichorous matter, or a disposition to gangrene in the larger vesicles; suppression of the salivation; cough, with hemoptoë; suppression of urine, or hæmaturia; the signs of congestive pneumonia or bronchitis on percussion and auscultation, more especially if attended by lividity of the lips, face, or extremities, indicating the affection of both lungs, which is generally the case; a brown or dry tongue; great restlessness, or a continued delirium, coma, or sopor; unconscious evacuations; exudations of a dark or ichorous blood from the mucous canals, &c. From certain of these, particularly those first mentioned, recovery may take place when the treatment is judicious and energetic, but the convalescence is long, and its progress is often delayed by ulcerations of the cornea, or general asthenic ophthalmia, causing blindness; by purulent depositions in the joints, or ulcerations or erosions of the cartilages, producing lameness; by otitis, terminating in deafness; by abscesses in various quarters; and by suppuration of the sub-cutaneous cellular tissue, causing cicatrices and alterations of the features. (*See the Complications, &c.*, § 42.)

37. The disease may assume a *semi-confluent form*, or one intermediate between the discrete and the confluent. This form is generally *superficial*, although not always or necessarily so, and much less frequently implicates the sub-cutaneous cellular tissue than the confluent. When thus superficial, whether semi-confluent or confluent, the eruption passes through its regular stages, but the inflammation does not extend deeper than the cutis vera. This superficial confluent form appears in the unvaccinated, and sometimes in the vaccinated; and the pustules over the whole body maturate equally and regularly, pursuing their usual course, and occupying the full time to their termination or desiccation. "This form of the disease was well known before the days of Jenner, and is not to be confounded with the confluent small-pox, as modified by vaccination."—(Gregory.) It takes either the same time to maturate as the distinct, namely, seven days, or an intermediate period between the discrete and the confluent, videlicet, about eight days, the confluent generally requiring nine or even ten.

38. iv. Variola after Vaccination.—The symptoms of this form of the disease may vary with the time which has elapsed from vaccination, but in the majority of cases they are the same as those characterizing the variola verrucosa, or the horn-pock (§ 29), or that very mild or mitigated form which maturates in five or six days, or in a shorter period. I have seen, on several occasions, and even described, as early as 1823 (*see Lond. Med. Repos.*, vol. xxi.), small-pox as it affected the members of the same family at different periods after vaccination; and in the younger persons, or those who had been vaccinated only ten or eleven years, the primary

fever produced an eruption which was merely papular, or hardly vesicular, while in the older, or in those who had been vaccinated a longer period, the primary fever was more severe, and the eruption either vesicular and verrucose, or pustular in a distinct or even confluent form; the severity and fully developed state of the disease being generally in proportion to the length of time which had elapsed from vaccination. In the former class of cases, the disease is thus more or less modified, and the secondary fever either slight or absent; but in the latter, or pustular, the modification is either slight or hardly apparent, the secondary fever being more or less severe. I have, moreover, seen cases, after undoubted vaccination, having been effected from thirty to forty years previously, that presented the most malignant states of the confluent disease, the pustules maturating imperfectly or slowly, or being filled with a black ichorous matter, the distemper presenting the characters described when treating of *putro-adynamic fever*. (*See art.* Fever, § 472, *et seq.*)

39. III. The Complications of Small-pox.—*A*. In a large proportion of confluent, and in some semi-confluent cases, the *mucous surfaces* are more or less implicated in the progress of the malady. The parts to which the air has ready access are most frequently affected, as the nose, mouth, trachea, &c.; but other parts covered by mucous membranes are also attacked, as the œsophagus, stomach, intestines, &c.: this *mucous complication* has been well described by Dr. Gregory. The eruption appearing on these surfaces is sometimes distinct, but more frequently confluent. Numerous white points appear on the tongue, palate, velum pendulum, and pharynx. Hoarseness or alteration of voice indicates that the same or similar changes extend to the mucous surface of the larynx and trachea; and the pain in swallowing shows that the pharynx and œsophagus are also affected, especially in severe cases. In these especially, a cough, which is at first dry, tearing, or clangous, is present, with more or less dyspnœa and oppression in the chest. As the malady progresses, the cough becomes more loose, but sometimes also more suffocative, and about the seventh or eighth day expectoration is more or less abundant, frothy, and viscid, containing some whitish specks. This affection of the respiratory surfaces often evidently increases, and extends over a larger surface, and constitutes a peculiar or specific form of acute *laryngo-tracheal bronchitis*, which may exist either singly or separately, or be associated with a *congestive pneumonia*, or superinduce this latter. When once this complication is present, and more especially when it is thus severely extended, most dangerous results are then generally observed. It is apt to occur in the most severe cases, or where the constitutional powers are weak, and the febrile symptoms present more or less adynamia. In these circumstances, this complication is the more liable to extend downward; and, from the trachea, it is prone to advance to the bronchi of both lungs; the *bronchitis*, or the *pneumonia*, or the *broncho-pneumonia*, thus superinduced, being not only asthenic or congestive, but generally double, or implicating both sides; hence the severity, the rapidity, and the fatality of the results.

40. Even when the complication is limited to the mouth, throat, and larynx, or proceeds no farther than the trachea, the œdema or swelling of the sub-mucous tissues may be so great, particularly about the seventh or eighth day, as to impede the free access of air to the lungs, and the same consequences ensue, especially in respect of the blood, as follow the extension of the complication to the bronchi and lungs. In either case, the blood does not undergo the requisite changes in the lungs; it is no longer, or only imperfectly, oxydized or arterialized, and the following phenomena supervene: The vesicles are flat, or, at least, do not acuminate; their contents are dark or ichorous, and the areolæ which surround them on the trunk and face are dark, or claret-coloured. Sometimes the surface presents a dark, erysipelatous appearance, attended by large watery blebs, or bullæ, from which an ichorous fluid escapes. On the succeeding day the tongue swells, and, with the lips and gums, exhibits a purplish hue; the extremities and nails become livid; low, muttering delirium is present; and either restlessness, anxiety, and dyspnœa succeed, or coma, distended bladder, or relaxation of the sphincters takes place, and death soon afterward supervenes.

41. The *digestive mucous surface* has presented changes more or less nearly approaching the pustular character, according to the accounts furnished by Riverius, Brendel, Weisberg, Blane, and many others, and these have been met with on the œsophagus, stomach, and small and large intestines. But the changes there observed, whether eruptive or pustular, have not been described with sufficient precision. Granting it to have presented somewhat of an eruptive appearance, it could not, however, have been pustular; for the nature of the tissues—the structure of the parts—admits not of a pustular formation. It is much more probable that, in the course of this as well as of other eruptive fevers, the glandular structures of the digestive canal become more particularly implicated, the morbid state of the blood exciting a special affection of these structures in the course of their functions, which have a very strict reference to the conditions of this fluid. In the most malignant or putro-adynamic state of this distemper, I have observed, especially in the dark races, the exudation of a dark, dissolved, or sanguineo-ichorous matter from one or several of the mucous canals, at an advanced stage of the distemper; an occurrence also observed in, and described when treating of, *putro-adynamic fever* and *hæmogastric pestilence*, and resulting from changes of a similar nature. In these, the alteration of the blood, and the loss of tone in the capillary circulation, admit of the exudation of blood from those parts or tissues especially, which, owing either to previous affection, or to loss of vital cohesion, are most prone to experience this change. (*See art.* Hæmorrhage, § 13, *et seq.*)

42. *B. The sub-cutaneous cellular tissue* is often implicated differently from, and even more seriously than, that which has been already cursorily noticed (§ 36). In the discrete form, this tissue is rarely affected, but in the confluent or semi-confluent, and in the variety which Dr. Gregory calls irregular or corymbose, the morbid action often extends deeper than the skin, and invades the cellular substance either partially or to a very considerable extent. According to this limitation or extension, the integuments are swollen and tense. When the scalp is affected, it becomes

remarkably swollen, and resembles erysipelas of this part, excepting that it is attended or followed by a diffuse or confluent pustulation, or a succession of small abscesses. The salivation already described (§ 34) is often accompanied with great swelling, more or less diffused, in the throat and neck. In some instances the tongue is involved; and when a diffused inflammation of the neck and throat thus extends to the tongue, an unfavourable issue then soon follows.

43. The cellular tissue in various other parts, especially where pressure is experienced, or where the vital cohesion of the tissue is the weakest, often becomes the seat of an asthenic inflammation, particularly in the more severe or malignant confluent cases. The sacrum, back, hips, elbows, scrotum, legs, and various other parts, may be the seats of boils or carbuncles, or of sphacelation. This change is most apt to appear during the secondary fever. Dr. GREGORY remarks, that he saw, at the Small-pox Hospital, an exact counterpart of the pestilential bubo and carbuncle in the groin of a small-pox patient. The face always suffers in these cases very severely; and if recovery takes place, it is not only pitted, but also seamed and scored by the cicatrizations consequent on the inflammation of the subjacent cellular tissue. Dr. GREGORY states, what I have also often noticed, that the disposition to suppuration of parts affected during the secondary fever of small-pox appears to be universal and almost uncontrollable. In some few cases the larger joints fill with purulent matter. Of the gangrene which so often occurs in the severe cases of variola, it may be remarked, that attempts should be made to prevent it, by attention and proper nursing and regimen, for in such cases it is often induced or aggravated by the absence of these, especially when the patient breathes an air rendered impure by putrid animal emanations, or contaminated by being too frequently respired, or breathed by too many persons.

44. *C. Ophthalmia* is a frequent and most important complication of small-pox. It has been unjustly stated that the inflammation of the tissues of the eye is attended by the formation of pustules on the cornea and conjunctiva; but, although these tissues are very susceptible of the inflammatory states complicating this malady, they cannot admit of pustular formations. When inflammation implicates the eye, it may either be limited to the conjunctiva, or extended deeper, and even affect the whole organ. It is most disposed to take place when the changes in the skin arrest the natural functions of this surface, and when, with the secondary fever, there is a manifest contamination of the circulation, or some internal complication. The ophthalmia of variola may be the only prominent local affection, or it may be associated with others of an important or more dangerous nature. Dr. GREGORY remarks, that ophthalmia commencing on the tenth day of the disease sometimes advances so rapidly, that in forty-eight hours the whole eye-ball is irrecoverably injured. The whole eye may even be converted into one large abscess. "More usually the inflammation runs into some one of its less violent and more familiar consequences. An ulcer forms at the outer edge of the cornea, by which the aqueous humour escapes, or at which a staphylomatous protrusion of the iris takes place; or the aqueous humour becomes clouded, or specks form on the cornea, from which blindness, more or less complete or permanent, results. Many things concur to render it almost certain that the affection of the eye in small-pox is connected with some altered condition of the blood, and the retention of the vitiated matters which ought to have been eliminated." Of this there can be no doubt; for, as I have shown in various parts of this work, the depression of organic nervous power, and the contamination of the blood, superinduce all the complications observed in the advanced course of both continued and eruptive fever, and of other maladies impairing the functions of excreting and depurating organs.

45. *D.* It must be manifest that the *circulating fluids are more or less contaminated* by the poison of small-pox, whether that poison be communicated by the mucous or by the cutaneous surface. This contamination must necessarily exist in all cases of the malady, but in a very inappreciable amount in slight and benign cases, the eruption on the skin being its more prominent effect. Where, however, the vitiation is greater, and especially where the eliminating or excreting organs imperfectly discharge their functions, or where vital power is much depressed by either the primary or secondary operation of the poison, the circulating fluids, and particularly the blood, become very remarkably and even sensibly altered. This alteration is manifested in various ways, but more especially in the advanced course of the malady; although it may be perceptible from the commencement of the primary fever. It is, however, more frequently noticed when the eruption appears, or at a later period, or when the eruption is proceeding to maturation. It is this contamination of the blood which, when more fully consummated, imparts the character of malignancy or of putro-adynamia to the distemper. This vitiation of the circulating fluids is rendered apparent, 1st, by the state of the blood when drawn from a vein; 2d, by the change in the appearance of the eruption; 3d, by the hue of the surface in the spaces between the pustules, and by the lividity of the lips, tongue, and extremities; 4th, by the petechiæ, vibices, or ecchymoses, intermixed with the variolous papulæ or vesicles; 5th, by the filling of the vesicles with a bloody matter, or with a dark ichor, or even with dark, dissolved blood; 6th, by the passive hæmorrhages which occur from the mouth, or nose, bowels, or urinary organs, or from the vagina, or from two or more of these outlets.

46. *a.* The more visible changes in the *blood* drawn from a vein are similar to those which I have described when treating of the *pathology of the* BLOOD (*see* § 125, *et seq.*), and consist chiefly of impaired crasis of the crassamentum, or a loose, gelatinous portion covering the black and hardly coherent portion of the coagulum. The alteration is often still more manifest in the blood poured out from one or more of the mucous canals, this fluid appearing as partially dissolved, dark, or ichorous, and being incapable of coagulating.—*b.* The *eruption* has at first a dingy or livid aspect; and as it proceeds to imperfect maturation, the vesicles fill only partially with a dissolved bloody serum, or with a matter containing the blood-globules changed to a blackish or brownish hue; and the vesicles are intermingled with petechiæ, &c., already mentioned.—*c.* The *general appearance* of these cases is often peculiar, and they are the most distressing and frightful manifestations of disease which can present

themselves to our observation. The expression of the countenance is most anxious. The tumefaction of, and eruption on, the face; the exudations of blood from the mouth and nostrils; the closed, livid, and tumid eyelids; the discharges from under them, or from the eruption; the swollen, softened, livid, or blackened hue of the general surface; the ichorous or bloody exudations from the urinary and genital organs and bowels—all combine to impress the mind with an idea of a pestilence, exceeding in severity and frightfulness of its aspect both the plague and yellow fever; and to suggest the idea of a general dissolution or putrefaction of the structures, even before life has taken its departure—a dissolution which has already partially taken place, in so far as that the tissues have actually lost a very large share of their usual vital cohesion, and have entered upon changes identical with those which appear soon after death.

47. The appearances now described are but rarely observed in the variola of the *white races*; yet I have met with them in a few cases, and in two or three instances the patients had been vaccinated many years previously. This malignant form of the malady was of more frequent occurrence formerly—before the introduction of inoculation and vaccination—than now, and was more common in some epidemic visitations of the distemper than in others. It was called by older writers the *variolæ nigræ*, or black small-pox; and is even now the not uncommon form of the disease among the *dark races*, especially the *Negro*, and particularly when the distemper spreads by the respiration of miasms from the infected. When the adult female is the subject of this state of the malady, a most depressing or exhausting menorrhagia is apt to take place. I attended, some years ago, with Dr. Gregory, a lady who was carried off by this form of small-pox. She had been vaccinated about thirty years previously, but she nevertheless presented the appearances just described. In this case, as in the following, mentioned by this physician in his work, the functions of the brain were not disturbed. "In February, 1842," Dr. G. remarks, "I saw, in consultation with Dr. L. Stewart, a lady in small-pox, whose whole body was the colour of indigo, and whom I at first believed was a native of Africa. She conversed with me in the most tranquil manner, and died a few hours afterward, proving that the nervous system is not necessarily, nor is it even usually, implicated in the petechial form of small-pox" (*Op. cit.*, p. 52). This exemption of the brain from disturbance is very often met with in other malignant fevers, more especially in putro-adynamic fever, in malignant puerperal fever, in the hæmagastric pestilence, in plague and pestilential cholera—maladies in which the circulating fluids are most signally vitiated. Dr. Gregory has remarked, what I have reason to believe to be correct, namely, that death may take place, in consequence of this remarkable condition of the blood, before any unequivocal signs of small-pox are developed, and has adduced two instances in which this appears to have occurred. Under common circumstances, the malignant or petechial form of variola exhibits an abundant confluent eruption, but this never makes much progress towards maturation. "Nature apparently gives up the struggle as hopeless. The patient is carried off very unexpectedly, perhaps on the fourth day, or from that to the sixth." But I have seen such cases sometimes protracted to the seventh or eighth day.

48. *E.* The *brain and nervous system* are often prominently affected in small-pox. This may occur at any age. Children are seized with convulsions on the accession either of the primary fever, or of the secondary fever; or they grind their teeth, roll their heads, scream, and squint. On these, inflammatory action, effusion, &c., supervene; or these changes have already taken place, to some extent, and occasioned these symptoms. In such cases, death very generally follows, either during an attack of eclampsia or convulsions, or with the usual signs of cerebral congestion and effusion. In older children and adults, the accession of the cerebral complication is attended by delirium of a violent or maniacal form—the *delirium ferox*. In some cases, the delirium is owing more to irritability of temperament, or peculiarity of constitution, than to inflammatory action; and in others, the nervous symptoms are attended by great depression of spirits, and by an inclination to commit suicide.

49. Dr. Gregory remarks, that "*a peculiar nervous affection* often supervenes on the tenth day, when the skin is extensively occupied by the confluent eruption, without nervous complication. It is identical with that which is familiar to surgeons as the consequence of extensive burns and scalds. General tremours, low delirium, a quick and tremulous pulse, a dry tongue, collapse of the features, cold extremities, and subsultus tendinum, are the symptoms of this nervous complication, and the precursors of a fatal event."—(*Op. cit.*, p. 51.) This is an accurate description of the unfavourable termination of a large proportion of confluent cases, as observed in weak constitutions, when the vital resistance is insufficient to oppose the depressing tendency of the distemper, or when the powers of life have not been sufficiently supported, or when support has failed to be efficacious. It is of great importance to recognise the accession of this state of sinking of vital power, in order to have a chance of opposing it with success.

50. *F.* Certain of the *bronchial and pulmonary complications* have been already noticed (§ 36, 40), especially such as arise from, or depend upon the contamination of the blood. But it is not unusual to observe a state of *bronchial irritation*, or *inflammatory action*, from the commencement of the febrile state, especially during the winter season. It may accompany the progress of the malady, without being materially increased, or without inducing a more violent form of the distemper. Frequently, however, and more especially in warm climates, or in the *dark races*, who have migrated to cold or temperate regions, the bronchitis extends generally to both lungs, and often to the substance of the lungs also, thus developing a form of congestive *broncho-pneumonia* (§ 39). Sometimes associated with bronchitis, or with pneumonia, or occurring independently of either of these, *pleurisy* supervenes, and constitutes a most dangerous complication of variola. It has been noticed as follows by the able author just mentioned: "Variolous pleurisy occurs between the twelfth and twentieth day. It is a peracute form of inflammation, remarkable for its sudden invasion, rapid progress, and invariable termination by empyema. The symptoms are very unequivocal: intense pain of

the side, a hard or wiry pulse, shortness of breathing, great anxiety of countenance, a peculiarly pungent heat, and dry state of the surface, betoken but too forcibly the state of the pleura, even without stethoscopic aid. Blood-letting is almost powerless in this state of the disease. Death usually happens on the third, or, at farthest, fourth day from the invasion of thoracic symptoms."—(*Op. cit.*, p. 54.)

51. *Variolous pleurisy*, whether occurring as a complication or as a sequela, is not confined to the confluent or any other form of small-pox. It may appear in the distinct or mild variety, or in the varioloid or modified disease, and in these forms it may be traced to exposure to a current of air, or to some other cause; and it may take place, especially when thus produced, at any stage of the malady. When it supervenes during the confluent distemper, and at the far-advanced stage, as just now described, it may justly be ascribed, as Dr. GREGORY has inferred, to the morbid condition of the blood at this stage—a cause which sufficiently accounts for the rapid progress and fatal issue of the complication. The variolous pleurisy, however, may not only be acute, or attended by very sensible indications of its existence, but also *latent*, until the consequent empyema or effusion has produced very manifest effects upon the respiration and blood.

52. *G.* The *heart*, *pericardium*, and *blood-vessels* are more frequently affected in a very prominent manner than has been generally supposed.—(*a*) The *endocardium* and *pericardium*, either or both, may be implicated in the progress of the more severe forms of variola, owing to the alteration of the blood, produced either primarily by the variolous poison, or, secondarily, by the absorption of a portion of the matter formed in the pustules, and by interrupted excretion; but, however induced, this complication is rapidly fatal, often without any other symptom than sudden sinking, and rarely with either pain or palpitation; more frequently with sudden anxiety and sense of dissolution.

53. (*b*) That the internal surface of the *blood-vessels become asthenically inflamed*, as an advanced complication or sequela of small-pox, has been on several occasions witnessed by me at the infirmary for children since 1820; but I believe not so frequently as the endocardium and pericardium. The veins are certainly oftener implicated than the arteries, or, at least, more sensibly so, especially when the affection of the former gives rise to obstruction of the circulation through them. But, as I attempted to show many years ago, *asthenic phlebitis* may supervene in the progress of malignant distempers, and fail of producing lymph from their internal membrane capable of coagulating; the product of the morbid action being a fluid exudation, which passes into and mingles with the blood circulating through the inflamed vessels, thus contaminating, or poisoning more fatally, the blood, heart, and blood-vessels.

54. *G.* The *purulent collections*, also formed within the capsules of joints, are rare complications or sequelæ of small-pox, yet they are not so rarely met with as to permit being overlooked. These deposits may be referred to the same series of changes, especially as regards the circulation, as have been noticed, and even fully discussed, with reference even to small-pox, when treating of purulent formations. (*See art* ABSCESS, § 27, *et seq.*)

55. *H. Abdominal complications* are less frequent than the thoracic affections now passed under review. They are nevertheless sometimes met with, especially during the epidemic prevalence of the distemper, and oftener in some epidemics than in others. This circumstance is not always readily explained; although in some cases it may be referred to modes of living previously to, or at the period of infection, or to the water, or other peculiarities of the locality, or to the place of residence.—(*a*) The most common of this class of complications are *diarrhœa* and *dysenteric affections*, sometimes leaving behind them, when convalescence has so far proceeded, diseased mesenteric glands, with emaciation and atrophy, as a sequela of the malady. Children in unhealthy localities are not infrequently affected by a mucous diarrhœa, or even with tenesmus and other symptoms of dysentery, in both the discrete and confluent forms of small-pox; the risk from this association being increased according to its severity. In a few instances, blood is passed with, or intermingled with the stools to an amount which tends rapidly to sink the patient. If the stools be merely streaked with blood, the risk is less; but even these may indicate great danger.

56. (*b*) Pain in the region of the *kidneys*, symptoms of congestion of these organs, and *hæmaturia*, are not uncommon in the severe states of the distemper, and are always to be viewed as most unfavourable occurrences, especially if the urine be scanty or suppressed. In cases of hæmaturia, the source of the sanguineous exudation has not been accurately determined, but there is reason to infer that it is the secreting structure of the kidneys, and that these organs are more frequently and seriously implicated in severe cases of this distemper than is commonly supposed. I do not say that they are so generally or so dangerously involved as in scarlatina, but this symptom, in connexion with remarkable scantiness of the excretion, and an almost complete suppression of urine, have been remarked by myself and others sufficiently often to attract a more particular attention to the function of the kidneys during the course of the malady, and to the appearances they exhibit in fatal cases, than has hitherto been directed to them. It must be manifest that even a partial impairment of the excreting offices of these organs, at any period of small-pox, must necessarily render the blood more and more vitiated, and superinduce various other dangerous or fatal results in vital organs, as I have fully shown when treating of *scarlet fever*. (See that *art.*, § 49, *et seq.*)

57. *I. Other complications* may occur, on rare occasions, in the course of variola, but they are very seldom detected during life, and more rarely looked for or disclosed on dissection. I shall only mention a few of those which have been noticed, and which should be kept in recollection during our dealings with this distemper: the presence of *intestinal worms*, which often aggravate the character of the disease, and which are often discharged at an advanced stage of the most severe and fatal cases; signs of inflammation, or congestion, or of functional disorder of the *liver* or of its appendages, various changes in these parts being detected after death; intumescence of the *spleen*, and softening of this organ in fatal

cases; one or other of the several forms of *erysipelas*, or diffusive or asthenic inflammation of the cellular tissue; inflammation of the *urinary bladder*, and exudations of blood from the inner surface of this viscus; and a similar affection, with an imperfect development of pustules, vesicles, or papulæ, on the *labiæ vulvæ* and *vagina*; this last being very frequent, and very troublesome in some cases.

58. ii. SMALL-POX MAY COEXIST WITH OTHER SPECIFIC OR EXANTHEMATOUS MALADIES.—This is a rare occurrence, but one which should not be overlooked. —(*a*) *Measles* coexist with variola more frequently, perhaps, than with any of the exanthemata. This combination has been observed, both distempers running their normal course, and uninfluencing each other, by DIEMERBROECK, DE HAEN, WEBER, TRACEY, KING, DELAGARDE, JONES, and others. MANGET says that measles delays the suppuration of small-pox, when both coexist; and ETTMÜLLER states, what is very surprising if it be true, namely, that he saw a case in which the eruption of small-pox broke out on one side, and that of measles on the other side.—(*b*) *Scarlet fever* has also been seen coexisting with variola, both distempers pursuing their regular courses, by JENSENIUS, MALFATTI, KRÜGELSTEIN, MARSON, BARNES, and DESSESSARZ. Dr. GREGORY informs me that he has seen, at the Small-pox Hospital, many unequivocal cases of the concurrence of small-pox and scarlatina anginosa; and that variola and cow-pox may coexist, as HOLM and others have contended. DESSESSARZ, who has paid much attention to the coexistence of variola with other specific diseases, mentions this concurrence of variola with *syphilis* and with *hooping-cough*, this latter delaying the eruption of variola, according to his observation. When vaccina and variola coexist, they may both run their usual course, or the one or other be more or less modified in aspect and progress.

59. iii. VARIOLA IN THE PREGNANT AND PUERPERAL STATES AND IN THE FŒTUS. — When a pregnant woman is seized with small-pox, abortion or premature labour may or may not take place, and the disease may or may not be communicated by the mother to the fœtus. Much depends upon the mild or the severe character of the distemper. If the disease be not very severe, the mother may not abort, and the fœtus may not be infected; but if the distemper be severe, confluent, or malignant, abortion takes place, as in nearly all instances of other malignant or pestilential maladies, the fœtus being dead, and furnishing proofs of its having contracted the malady. The communication of variola to the *fœtus* has been observed by H. AUGENIUS, FERNELIUS, DERHAM, FORESTUS, MEAD, MAURICEAU, KITE, MORTIMER, WRIGHT, FLINDERS, WATSON, DIMSDALE, HUNTER, LYNN, TURNBULL, PEARSON, and HAYGARTH. Dr. GREGORY remarks, that it does not necessarily happen that a pregnant woman taking small-pox conveys the disease to the child; several instances to the contrary have occurred at the Small-pox Hospital. An opinion was entertained by Dr. MEAD (but erroneously), that where a woman undergoes small-pox without aborting, the infant would remain through life unsusceptible, having, in fact, passed through the disease in utero. Dr. JENNER has detailed two cases, which prove very satisfactorily that a fœtus in utero may contract small-pox, provided the mother be exposed to the contagion, although she herself does not take it. "An infant, born under these circumstances, sickened for the small-pox five days after birth, and twelve from exposure to contagion."—(*Op. cit.*, p. 751.) In several collections fœtuses are preserved whose skins are covered with variolous eruptions. The earliest period of fœtal life at which Dr. GREGORY ever saw traces of variolous eruption is four months.*

* The following abstract is taken chiefly from the American edition of Dr. GREGORY'S work on "*Eruptive Fevers.*" Dr. MITCHELL (*Amer. Journ. of Med. Science*, vol. vii., p. 555) adduces the case of a mother who bore the marks of small-pox, with which she was affected in childhood, and whose infant was born in an apparently healthy state, but exhibited symptoms of variola three days after birth, and nine days after birth the pustules were in a state of complete maturity. M. DENEUX (*Ibid.*, vol. xi., p. 499) instances the case of a woman who had been vaccinated and never had small-pox, but who bore an infant covered at birth with confluent small-pox in the eleventh or twelfth day of the eruption. Dr. C. GUOLI (*Ibid.*, vol. iv., *new series*, p. 485) states that a child was born in June, 1841, covered with pustules of variola. The pustules were at their height on the second day after birth, and matured on the fifth; but the child died on the ninth day after birth. The mother had been vaccinated when an infant, and had escaped small-pox. M. GERARDIN (*Ibid.*, vol. vi., N. S., p. 210) reported to the French Academy of Medicine, in 1842, an instance of a child born with the eruption in a state of suppuration; but no mention is made of the mother in this case. Dr. JOSLIN (*Ibid.*, vol. v., N. S., p. 249) met with a case of small-pox in the fœtus, in New York, in 1842. The fœtus had on its body about 170 regularly-formed pustules, apparently such as they are from eight to ten days after the attack. The child lived only a quarter of an hour. The infection had been received by the mother just thirty days previous to the birth of the child. She was exposed but once to a single case, at the very commencement of the eruption, and for a single day. She had been vaccinated in early childhood, and the operation had been repeated on the day of exposure by Dr. JOSLIN himself, but without effect. M. DAPAUL (*Bullet. de Thérap.*, 30th April, 1849) saw a case of transmission of variola from a mother to her child, which had numerous pustules at birth. The mother had visited a person with the disease a short time before, without taking it. A case occurred in the Maternity Hospital, in Paris, in which the face, scalp, and different parts were covered with the pustules of small-pox at birth, though the mother retained the marks of vaccination, and had never had the small-pox. About ten days before, she had seen a patient at La Pitié, near another with small-pox (*Lancet*, 18th February, 1843, p. 741). Dr. MEAD (*Works*, ch. iv., p. 253) has recorded an instance in which a woman was delivered of a dead child at the full time, covered with variolous pustules. She formerly had the disease, and was attending her husband with it when delivery took place. Dr. LEBERT (*Bullet. de Thérap.*, 30th April, 1849) exhibited to the Biological Society of Paris a fœtus about four months old, whose body was covered with pustules of variola. The mother had the disease slightly, and aborted during her convalescence. Dr. KING (*New York Med. and Surg. Journ.*, April, 1840, p. 292) mentions the birth of a living child at seven months, covered with umbilicated pustules, the mother having entirely recovered, and presenting at the time of its birth no evidences of the eruption, excepting the red spots succeeding the scabs; the child having been born twenty-one days after she was first attacked, or seventeen days after the appearance of the eruption. Dr. L. V. BELL (*Amer. Journ. of Med. Science*, May, 1836) adduces an instance of a lady who had confluent variola at the seventh month of pregnancy, and escaped without abortion—a rare circumstance in confluent small-pox. At the expiration of her full term she was delivered of a healthy child, whose abdomen and thighs were marked with decided small-pox pittings, and who was unsusceptible of the vaccine disease. VAN SWIETEN (*Commentaria*, vol. v., p. 8) records, among several others, a similar case to the last; the child was born at the full time, with pits of small-pox, the disease having been transmitted to the fœtus through its mother, who had herself undergone the disease. Dr. HOSACK (*Med. Essays*, vol. ii., p. 111, and vol. iii., p. 473) refers to numerous other instances, recorded by authors, of the communication of variola to the fœtus in utero.

"It will be found, on examination of the preceding and of other cases, that the communication of variola to the *fœtus in utero* has occurred after vaccination of the mother in infancy, and after her revaccination on the day of her exposure, and also after variola, both naturally and by in-

60. When a pregnant woman is seized with small-pox so severely as to place her life in jeopardy, she aborts, the fœtus being generally dead; and the mother very rarely recovers. The abortion probably favours this event, especially if it be attended by much sanguineous discharge; but this event has taken place with equal rapidity where this discharge has been most remarkably small, or altogether wanting, as in a case which I lately attended with Mr. BARNWELL. The same issue is observed in respect of other dangerous maladies, especially low fevers, scarlatina, measles, and the several malignant and pestilential distempers. When small-pox is caught shortly before delivery, so that the fœtus is born before the disease has proceeded its full course, the fœtus is generally infected, and the distemper assumes in the mother a most severe and complicated or confluent form, recovery seldom taking place. I have seen several cases of variola in the puerperal state, infection having taken place before confinement, but I have met with only one in which the disease presented a mild form.

61. iv. OF THE CHARACTERS OF THE LOCAL AFFECTION AND OF THE FEVER.—*A.* The *local changes*, whether external, as evinced by the varying condition of the eruption, or internal, and constituting the contingent complications of the malady, present every phase or gradation of inflammatory action, from the most slight to the most disorganizing, from the sthenic to the most asthenic, or that most rapidly passing into the dissolution of structure.

62. *B.* The *type of fever*, whether of that ushering in the disease, or of that developing the suppuration or maturation, also varies in respect of power and vital resistance—as respects the organic nervous energy and the states of the circulation and circulating fluids—from that which may be viewed as inflammatory, until it sinks into the most malignant and pestilential, passing, in different cases, through every intermediate type, form, or phase; the local changes always presenting a more or less intimate relation to the state or character of the febrile commotion. Nevertheless, however numerous the forms or states, either of the local changes or of the constitutional disturbance, this distemper, more remarkably even than any other specific disease, preserves all its special properties unaltered and unalterable, elaborates the same poisonous miasm and virus, and propagates its kind through innumerable generations, without changing or even modifying any of its features. The same now as it was twelve centuries ago, it has lost none of its qualities or attributes, and gained no new property. We observe it now as it was observed from the earliest periods of its history; with the same remarkable modifications in both the local changes and the constitutional disturbance, the slightest and most benign form of morbid action, and the most pestilential; each form, and each intermediate phase appearing in the same epidemic, in the same locality, and in the same family, the distemper, nevertheless, preserving its special nature and identity.

63. The very remarkable modifications of variola now described are to be imputed, 1st, to vaccination; 2d, to inoculation; 3d, to infection by the mucous surfaces, and especially by the respiratory passages; 3d, to the dose or the quantity of the poison which has infected the frame, particularly by these passages, relatively to the vital power and resistance of the patient; 4th, to the constitutional power, habit of body, diathesis, temperament, and health of the patient; 5th, to his race, or to the variety of his species; 6th, to his modes of living, mental power, and moral courage; 7th, to the physical agents which surround and influence him, especially the conditions of the atmosphere in respect of temperature and humidity, of purity and requisite renewal; in short, to the various circumstances which I have pointed out, in full detail, when treating of the several causes and sources of pestilences, with reference to their removal and avoidance (*see art.* PESTILENCES, PROTECTION FROM); and, 8th, to the character or nature of the prevailing epidemic constitution.

64. According to the influence of these, either singly or in various combinations, the disease assumes a mild, or a distinct, or a severe, or a semi-confluent, or a confluent, or a complicated, or a malignant form, the primary and consecutive fever developing these several states, or at least presenting, conformably with them, and with strict reference to them individually, either a slight, or mild, or an inflammatory, or an adynamic, or asthenic, or a putro-adynamic, or a malignant character, the appearance of the eruption being one of the chief indications of the type or character of the fever. Certain of the modifying influences now enumerated may require a brief remark. The first four mentioned manifestly need no comment.

65. The *race*, or the *variety of the species*, to which the patient belongs, is of the greatest importance in modifying the distemper. The white race, especially that inhabiting northern and temperate climates, experiences a much milder, and more frequently a discrete form, than the dark races, particularly the Negro. Among the latter races the disease more commonly assumes a confluent or malignant form, and is the most dangerous pestilence which can overtake them. It is to them what the hæmogastric pestilence is to the Europeans when they migrate to the hot countries where and when that pestilence is epidemic. Among the dark races this pestilence is comparatively mild, but most fatal among the white race; while the very opposite obtains in respect of small-pox. As to this, I speak from personal observation. There is nothing which can be conceived more pestilential than I have seen small-pox when it has seized upon a Negro town or

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oculation. It has also taken place when the mother is yet suffering from the disease, and after she has passed through it years previously, and when she herself escapes entirely.

"The fœtus may be infected by absorption of the virus through the mother, without her experiencing any effect from it; or the disease may be transmitted directly by inoculation of the mother, and may be communicated any time from the fourth month (and perhaps earlier) to the full time. The fœtus may be thrown off in three or four days after cessation of motion, or may be retained for three or four weeks.

"The child may be covered with eruption at birth, and this eruption may present itself in different stages of its progress in different cases, even up to the eleventh or twelfth day of the eruption, or may not appear until three or four, or even seven days after birth. It may also be born at full time, with pits left by the disease some weeks previously."

The child either falls a victim to the disease at once, or lingers for only a few days; but it has been born healthy at the full time, with marks of previous disease; and it has survived when the disease, in a mild form, has appeared after birth. On this, and all other topics connected with variola, the admirable Commentaries of VAN SWIETEN on the Aphorisms of BOERHAAVE will be studied with advantage.

community: the general malignancy of the distemper, the desertion of the afflicted by the healthy who have not passed through the disease, and the semi-putrid or decomposed and hideous appearances of those who are yet alive, but nevertheless exhibit much of the characters of structural dissolution, cannot fail of making a never-to-be-forgotten impression on the observer.

66. The state of the atmosphere is also very influential in forming the general character of small-pox. In dry, pure, and moderately cold or cool states of the air, this distemper is much milder and less prevalent than in hot seasons, and in humid and still states of the atmosphere. In countries enjoying the former atmospheric conditions, the malady is less generally and severely epidemic than in warm countries, where the latter conditions obtain; there are, however, frequent exceptions to this law that probably are dependent upon the unknown nature of epidemic constitutions; but this topic, and others connected with it, will be considered more fully in the sequel (§ 93, *et seq.*).

67. The form or character of the malady thus depending upon the circumstances now mentioned, and modified as above described, must, in the present state of our knowledge, be viewed as the result of agencies which tend either to resist or to limit the susceptibility and the poisonous properties of the miasm or virus which produces it on the one hand, or to increase that susceptibility, or to develop the injurious operation of these poisonous properties on the other. We observe, 1st, that a previous attack, with very rare exceptions, destroys the susceptibility of a second infection; 2d, that vaccination produces a similar effect, but for a certain time only, at least in many instances; 3d, that the mode of communicating the malady, which is the best calculated to secure the introduction of the smallest possible quantity of the poison into the system capable of infecting it, is the safest and best, namely, inoculation; 4th, that whatever tends to promote the excreting functions, to depurate the blood, to resist the contamination of the fluids, and to support the vital powers, also favours the production of a mild or discrete form of the malady; 5th, whatever has a contrary tendency—whatever occasions contamination of the blood, as a foul, close, or frequently-respired air, and interruption of one or more of those functions, by means of which effete or injurious elements are eliminated from the blood—develops a severe, a complicated, or a confluent and malignant form of small-pox; and, 6th, whatever reduces vital power and resistance at the period of infection, and favours the reception of a large dose of the poisonous miasm into the lungs, as in cases of infection by respiring the morbid emanation directly or closely from the sick, relatively to the susceptibility of the individual, generally gives rise to the dangerous varieties of the distemper just mentioned.

63. v. Appearances on Dissection. — The changes which more especially belong to small-pox are those observed in the skin and mucous surfaces. Those of the skin require no remark. The rare exception, however, of death occurring either before the eruption has appeared, or at a later period, when the amount of internal disease, or the poisoned state of the blood, has prevented the evolution of the eruption, should be kept in recollection. The pharynx, larynx, and trachea generally display more or less disease, especially in cases which have proved fatal from the seventh to the tenth day. The mucous membrane of these parts appears covered with viscid, puriform matter, more or less copious, and of a brownish or grayish colour. Underneath this, the membrane is generally found congested, softened, thickened, and pulpy; and in the more malignant cases it is black and sloughy, and exhales an offensive odour. Congestion, softening, discoloration, &c., with a muco-puriform or sanguineo-puriform exudation, may often be traced down the trachea, and thence to the bronchial ramifications to a greater or less extent. The lungs frequently evince congestive or inflammatory appearances, or rather such changes as may be referred to a congestive pneumonia, or this associated with bronchitis, or an alteration approaching in appearance to that of splenization, with or without a puriform infiltration. The pleura is often inflamed, but it presents no changes different from those which are often seen in asthenic inflammations of serous membranes, occurring in the course of other exanthematous and adynamic fevers. As in these, so in this, the inflammatory affection is attended by injection, softening and thickening of the membrane, with an exudation of lymph forming a layer varying very much in thickness and density. These changes extend more or less to one, or even to both sides; the cavity of the pleura also containing much sero-puriform fluid resembling a dirty whey, or a mixture of milk or cream and water.

69. It was believed by many that, in the dangerous states of small-pox, a pustular eruption took place in various portions of the digestive canal; and there can be no doubt of considerable alteration being observed in this quarter. These alterations may have assumed a papular or vesicular form, or one approaching the appearance of pustules, when the follicular glands of the digestive surface were chiefly inflamed. These changes have been remarked in the œsophagus, in the stomach, and in the small and large intestines. Dr. Gregory remarks, that "much discussion has taken place regarding the occurrence of variolous pustules on the gastro-enteric mucous membrane. Cotugno, Weisberg, Reil, and others, who have paid great attention to the subject, concur in opinion that this structure is not capable of developing them. Sir G. Blane, again, reports a case where this membrane presented the appearance of ulcerated spots, which he compared to variolous pustules. The experience furnished by the Small-pox Hospital is in favour of the old doctrine. Inflamed, enlarged, and ulcerated follicles, with petechial patches, may indeed be noticed in a few cases; but such changes are in all respects the same with those observable in typhoid fevers." I have seen ecchymoses, with or without those alterations, in the digestive mucous surface, and in the internal surface of the urinary bladder, but much more rarely in this latter situation. The kidneys are often congested, and the internal surface of the pelvis of the kidneys is also congested, softened, and discoloured. But these appearances, as well as those observed in the brain and its membranes, in the spleen, liver, and biliary organs, are very much the same as those seen in fatal cases of the other exanthemata, and of low or malignant fevers.

70. IV. Diagnosis of Small-pox.—It is not easy, and, indeed, seldom even possible, to distinguish the primary fever of variola from that

of the other exanthemata, or even from the commencement of continued fever. In children, however, there is a more frequent occurrence of convulsions, more sudden and severe vomiting, and pain at the epigastrium, than in these; and in adults the muscular and other pains are more severe.—(*a*) The fever of *measles* is more generally attended by cough and watering of the eyes than that of variola; and the eruption is about twenty-four hours later in the former than in the latter. The papulæ of small-pox are firmer and deeper seated than those of measles, which are superficial, and do not give so knobby or so granular a sensation to the touch as those of the former, which implicate the cutis vera.

71. (*b*) *Febrile lichen* may be confounded with small-pox; but the interval between the occurrence of rigour and the appearance of eruption is much shorter in the former, generally only twenty-fours, or half the time of that of the latter. The eruption of variola generally appears first on the face, while that of lichen takes place uniformly over the head and trunk, is superficial, and devoid of the granular feel to the touch which belongs to variola. (*See art.* LICHEN.)

72. (*c*) A form of *secondary syphilis* sometimes occurs, in which the eruption over the face and trunk is very similar to distinct small-pox, and passes through the grades of papulæ, vesicles, and pustules. It is, however, generally preceded by little, or by a slighter fever, and the eruption is much more tedious in its development than that of variola; the pustules do not maturate, or proceed simultaneously, but irregularly, or in successive crops. The general aspect of the patient, and the history of the case, will farther assist the diagnosis.

73. (*d*) The diagnosis between *variola* and *varicella* has been fully discussed, and the distinct natures of these have been shown at another place; but independently of various other points of difference, the impossibility of inoculating the latter, the occurrence of it after cow-pox, and even after small-pox, and the absence from varicella of the deep-seated granular sensation to the touch, and of the umbilicated vesicle, characteristic of the variolous eruption, sufficiently distinguish the one from the other.* (*See art.* CHICKEN-POX, § 2, 3, 10, 11.)

[No single fact in pathology is better established than that the eruptions of small-pox are extremely various. I have described an epidemic varioloid disease which prevailed in the town of Gorham, Ontario county, New York, in the summer of 1853,* and from the appearances presented have drawn the following conclusions:

1. That the small-pox virus will give rise to eruptions of a very diversified character; the modifications being produced by previous vaccination, the period which has elapsed since vacci-

* The following remarks respecting the distinct nature of *Chicken-pox* and *Small-pox*, contained in Dr. GREGORY's excellent work, already referred to, deserve perusal, and quite agree with my own observation. "The first thing I observe in varicella is the eruption of vesicles of the size of a split pea, being simple elevations of the cuticle, or minute blisters. The parts chiefly occupied by the eruption are the back and scalp. The face is not so universally the seat of eruption as in variola; nevertheless, at times the face is extensively occupied. The vesicles vary in shape. Dr. WILLAN, who loved minuteness, wishes to distinguish three kinds—the lenticular, the conoidal, and globate. I cannot see these distinctions myself. The vesicles are surrounded by a superficial and narrow areola. They appear in successive crops for two or three days. While the new vesicles are forming, the old ones shrivel and dry up. On penetrating the vesicles, a clear lymph, scarcely at all mucilaginous, escapes, and the cuticle falls to the level of the surrounding skin. There is no tumour, no varus. If the vesicles remain unbroken for twenty-four hours, the contained fluid becomes slightly opaque. They are very itchy, and, when rubbed, a degree of superficial inflammation may succeed, sufficient to convert the lymph into an imperfect pus. The scabs of varicella are very small, and, as the lymph is wanting in mucilaginous quality, they are granular. The desiccation is very rapid, and in six days the complaint completes the whole cycle of its phases. No constitutional symptoms of much importance are present. The complaint often shows itself in schools, and runs through all the young members of a family. It is manifestly infectious and epidemic."

Varicella almost exclusively attacks children; it is very rarely seen in adults. "It is taken indiscriminately by those who have and those who have not been vaccinated. It is now nearly always taken *after* vaccination. Whether it was taken equally after inoculation of small-pox I cannot tell from my own experience, but I have the authority of the late Sir HENRY HALFORD for saying that it was. These general considerations are of themselves sufficient to decide the question of non-identity. But if we examine the subject still more closely, we find that the organization of the varicelloid vesicle differs from that of the variolous; there is no umbilication, no central depression, no slough. There is simply elevation of the cuticle, of irregular and undetermined arrangement. Here we see no groupings into threes or fives—no crescentic or circular figures formed. Every thing in varicella is hurried forward—the incubation, the eruption, the desiccation."

There is a form of small-pox which, in some of its features, and from its mildness, may be mistaken for varicella; "and physicians in former times, looking only to the general, and neglecting the minute anatomical characters of the eruption, have thought proper to confound the two diseases. By way of distinction, we will call the one *varicella vera*; the other, *variola varicelloides*. In the true varicella there is little or no premonitory fever. In the variola varicelloides there are at least forty-eight hours of preceding febrile disturbance. In the varicella vera there are no hard veri or tubercles. In the varicelloid form of variola, tuberculous elevations of the skin are distinctly perceptible. In the vesicles of the one there are no central depressions, in the other central depressions exist." In true varicella the crusts quickly fall off, and rarely leave any pits. Can varicella be communicated by inoculation? "Dr. WILLAN entertained the belief that it can; but his experiments are few (two or three only), and these few, to my mind, very unsatisfactory. Since his time, Mr. BRYCE, by more extended and more careful investigation, has set the question at rest. He states that he has inoculated with the fluid of varicella vera at all periods of the disease, and at all seasons of the year, children who had never undergone either small-pox or cow-pox, and yet that he had never been successful in producing from it either variola or varicella. Since the date of BRYCE's experiments (1816), I know of none on the inoculation of varicella."

What, then, are the arguments which can be brought forward in support of the doctrine of the identity of small-pox and chicken-pox? I have adduced the arguments which have been urged by Dr. THOMSON and others in favour of this doctrine, and I have answered them seriatim in another place (*see art.* CHICKEN-POX, § 2, 3, 10, 11); but, nevertheless, it is interesting to know what farther Dr. GREGORY has stated as to this topic. Dr. THOMSON's great argument is, "that varicella presents itself when variola prevails, and never without. Hence," says he, "we may deduce the probability that one contagion is operating, not two." The answer to this is, that the facts are incorrectly stated. Varicella frequently prevails without variola. Dr. MOHL has shown this most satisfactorily from the experience of the Copenhagen epidemics. From 1809 to 1823, chicken-pox was annually observed at Copenhagen without accompanying variola; since 1823 both diseases have prevailed epidemically, but the physicians could always trace their sources, and this convinced them that the generating miasms were distinct. Besides, the doctrine goes for nothing if it can be shown, as has been shown over and over again, that some children take varicella after cow-pox, and others cow-pox after varicella, while sometimes both diseases may be seen going through their phases at the same time. "It cannot be doubted for one moment, after reading the details of this controversy in the works of Dr. THOMSON and elsewhere, that a very large proportion of the cases of alleged secondary or recurrent small-pox are really cases of genuine lymphatic varicella mistaken for small-pox;" or, I may add, that the supposed first attack of variola was merely that of varicella.

* [*American Journ. Med. Sciences*, vol. ii., p. 120.]

nation was performed, age, general health, habits, idiosyncracies of the patient, and unknown causes.

2. The eruption may have all the specific characters of *variola verrucosa* (horn-pock), water-pock, swine-pock, varicella, varioloid, pemphigus, purpura, and probably other forms of cutaneous disease.

3. In general, those persons who have been vaccinated will have the lighter forms, as *variolodes* of Gregory, and *varicella*, though in some cases it may be severe and even confluent.

4. As a general rule, the disease will assume a milder form in proportion to the recency of the vaccination.

5. The eruption produced by small-pox virus may recur in a vesicular form, or in a papular, speedily becoming vesicular, or it may be pustular, the pustules sometimes with and sometimes without a central depression, or it may assume the form of purpura, &c.

6. The eruption may be irregular in size and form, as well as in the place of its first appearance, and may occupy merely the surface of the skin, or may occupy the true skin, leaving pits. It may come out in successive crops on the body, after it has reached its height on the face, as in true varicella.

7. The fluid thrown out by the eruption may be water or lymph, sero-purulent or purulent, sanguinolent or sanguineous (*purpura*); and the pock may dry into horny scabs covering tubercular elevations of the skin, or scale off and leave the skin perfectly smooth, though of a claret, dusky, or livid hue, or scarred and pitted.

8. At the decline of the eruption, vesications on an inflamed basis, to a greater or less extent, may appear, filled with air or lymph, and small abscesses may form in the sub-cutaneous cellular texture.

9. The eruption has generally none of the smell peculiar to small-pox, this being confined, for the most part, to the confluent cases.

10. The disease may be so severe as to prove fatal, or so slight as not to be attended with eruptions, and but slight if any constitutional disturbance, and this both in the vaccinated and unvaccinated, though rarely in the latter.

11. The varioloid form often cannot be distinguished from pure varicella by the character of the eruption; frequently crops of vesicles may appear in succession for several days, the first beginning to shrivel while new ones are forming; the vesicles that remain after the third day becoming slightly opaque, and like pearls; taking on inflammation by the irritation of friction or scratching, so as to be collected into pustules; the scabs small and gummy, drying quickly and falling off, leaving small cicatrices or marks, and attended with little if any constitutional disturbance.

12. These conclusions do not militate against the doctrine that there is a separate disease, *chicken-pox* (*varicella lymphatica*), which springs from a specific contagion, producing a vesicular eruption, running a definite course; having no tendency, when undisturbed, to suppuration, occurring ordinarily but once, affording no protection against small-pox, as small-pox affords no protection against it.

13. Chicken-pox often occurs epidemically in various parts of our country, unmixed with varioloid cases, and not traceable to variolous infection, showing it to be a distinct disease.

14. Lastly, when practitioners meet with any eruption which is at all equivocal, they should use the same precautionary measures for preventing the extension of the disease as if they were certain it was modified small-pox.

There are, then, cases of small-pox in which the eruption cannot be distinguished from that of genuine *varicella*, and it may assume the form of *purpura*, *pemphigus*, and other well-known cutaneous diseases. The attempt to draw the line in all cases from physical characters, between small-pox and varicella, must necessarily fail, as such do not always exist (*see the New York Journ. of Med.* for September, 1853). I have seen, *e. g.*, in a family of seven children, all vaccinated when young with what I believe to have been genuine kine-pock matter, every form of the disease (taken from the same variolous infection), from confluent small-pox down to a mild vesicular eruption, with all the characteristic marks of true *varicella*. The pathognomonic characters, therefore, if such exist, must be found in other marks or phenomena than the eruption.]

74. V. The Prognosis of Small-pox is tolerably manifest from what has been already stated. The circumstances enumerated above as modifying and aggravating the fever of small-pox (§ 63, *et seq.*), increase also the *danger* of the distemper; but the following more especially tend to this: 1st. The quantity and confluence of the eruption. 2d. The state of the circulating fluids. 3d. The presence and nature of the complications, especially those of the respiratory organs and nervous centres. 4th. The age, habit of body, and temperament of the patient. 5th. The circumstances and influences under which the patient is placed; and, 6th. The season, temperature, and epidemic constitution in which the disease occurs.

75. *a.* A *confluent form* of the malady should, even when proceeding favourably, be viewed with distrust; for, in children, a fit of convulsion may occur, and carry off the patient; and in adults the blood may become contaminated to an extent incompatible with the continuance of life; or the secondary fever may farther implicate vital parts. If the vesicles on the trunk and extremities be flat, with a claret-coloured or livid areola, "while the eruption on the face is white and pasty, no reasonable hope of recovery can be entertained." An excessive quantity of eruption always tends to depress vitality, to vitiate the blood, and to favour the occurrence of internal complications, which concur with these to destroy life. On the other hand, if the pustules on the extremities acuminate, and exhibit a crimson areola, a good ground of hope is furnished.

76. *b.* The *contamination of the fluids*, as shown by the hue of the surface, the colour of the lips, tongue, and gums, so far as they can show it; by the appearance of the vesicles; by the state of the evacuations; and by whatever indicates a tendency to putrescency, or a partially dissolved state of the blood and depressed organic nervous influence, is extremely dangerous. Petechiæ, ecchymosis, gangrenous, or sloughing sores; hæmorrhages from mucous canals, the blood being dark, dissolved, or ichorous; menorrhagia or hæmaturia; the vesicles being filled with a dark, bloody, or ichorous matter; purulent depositions in the joints, &c., are generally fatal indications.

77. *c.* The occurrence of any of the *pulmonary complications* mentioned above; cough or hoarseness at an early period of the disease; hæmoptysis at a more advanced stage; bronchitis, or con-

gestive pneumonia, or asthenic pleuritis, especially when either extends to both sides, are extremely unfavourable. The appearance, also, of an abundant or confluent eruption in the puerperal state, and particularly soon after parturition, is always attended by the utmost danger.

78. *d.* The state of the *nervous system* is most important in the diagnosis. Continued delirium, or prolonged want of sleep, restlessness, moaning, despondency, or an inward persuasion of death, or an apathetic condition, or unconcern as to the result, so frequently observed in pestilential maladies, suppression of urine, sopor, lethargy or coma, leipothymia, or a tendency to faint upon raising the head from the pillow, or attempting to sit up, are severally dangerous or fatal symptoms.

79. *e.* The *age* of the patient is of much importance in the diagnosis, especially in confluent and semi-confluent cases. Dr. GREGORY remarks, that the "extremes of life are those on which small-pox always falls the heaviest. Persons above 40 years of age seldom recover even from the semi-confluent small-pox. Children are in danger from an amount of eruption that can scarcely be called semi-confluent. In both, the processes of maturation and cicatrization are attended by great exhaustion of nervous power, the result of which is often the setting up of acute inflammation in an internal organ essential to life—either the brain, the larynx, or the lungs. The most favourable age for taking small-pox is from the seventh to the fourteenth year, when the powers of life and reproduction are in their fullest vigour."

80. *f.* The *habit of body and diathesis* have considerable influence on the result. A plethoric habit of body, a sanguine, a melancholic, a leucophlegmatic, or a bilious temperament, constitutional asthenia or debility, and a scrofulous diathesis, are more or less aggravating circumstances as respects either the severity of the disease, and abundance or confluence of the eruption, or the complication and sequelæ of the malady.

81. *g.* The circumstances which indicate a *favourable issue* are, a discrete form of the disease; the absence of any symptom of complication; a natural tone of the voice, and freedom from cough and hoarseness; an age between 6 and 26; the occurrence of the malady at a cool, dry season, and under other favourable influences, as respects air, ventilation, and healthiness of position.

82. *h.* Much, however, depends upon the state of the patient before the accession of the malady, upon the influences in operation during the treatment, upon the measures which have been employed at the commencement of the distemper, or during its earlier stages; upon the purity of the air, and the ventilation of the patient's apartment; upon his nursing, and the non-interference of friends; upon the character of the prevailing epidemic, or of the reigning epidemic constitution; and upon various subordinate circumstances and unexpected contingencies.

83. VI. THE CAUSES OF DEATH from small-pox are, 1st. During the first week, or prior to the maturation of the eruption, the poisonous influence of the variolous miasm or virus on the blood, and the consecutive effects of the poison on the organic nerves and nervous centres; 2d. During the second week the greater number of deaths occur, and the most common cause is asphyxia, or consecutive vitiation, and interrupted oxydation of the blood, owing to the prominent affection of the respiratory passages, or of the lungs, or to suppression or interruption of the urinary excretion; 3d. During the third week, or when secondary fever has advanced, death may be produced by effusion on the brain, or by effusion in the pleura, or in the pericardium, or by the complications which occasion it in the second week; or by gangrenous destruction of some portion of the integuments; 4th. During the fourth or following week, death may result from erysipelas, or from some other complication or sequela of the distemper. The following table, furnished by Dr. GREGORY, exhibits the days on which 168 cases of small-pox were fatal at the Small-pox Hospital in 1828–29, and proves that no importance can be attached to critical days in this distemper:

Days.	Fatal Cases.	Days.	Fatal Cases.	Days.	Fatal Cases.
3d.	1	13th.	11	24th.	3
4th.	5	14th.	5	25th.	1
5th.	10	15th.	7	27th.	1
6th.	5	16th.	5	28th.	1
7th.	11	17th.	3	29th.	1
8th.	27	18th.	3	31st.	1
9th.	15	19th.	1	32d.	1
10th.	14	20th.	2	35th.	1
11th.	16	21st.	3	38th.	1
12th.	11	23d.	1	39th.	1

Table exhibiting the total Number of Persons having Small-pox, admitted into the Small-pox Hospital of London, in the Years from 1841 to 1850, inclusive, with the Proportion of Cases admitted *after Vaccination*, and the Mortality in each Class respectively.

Years.	Total Admissions of Persons having Small-pox.	Deaths.	Per Centage of Deaths.	Total of Persons Vaccinated with Cicatrices.	Deaths.	Per Centage of Deaths.	Total of Persons unprotected, including the Vaccinated without Scars.	Deaths.	Per Centage of Deaths.	Per Centage of Admissions after Vaccination with Scars.	Persons professing to have had Small-pox previously.	Deaths among Persons professing to have had Small-pox previously.
1841	342	74		151	10		191	64		44	2	1
1842	141	34		62	4		79	30		44	1	0
1843	149	27		69	0		80	27		46	2	0
1844	643	151		312	24		331	127		50	3	2
1845	367	79		217	13		150	66		60	3	0
1846	147	29		77	5		70	24		52	2	0
1847	450	81		230	17		220	64		51	8	3
1848	686	168		365	38		321	130		53	4	2
1849	190	33		115	11		75	22		60	4	0
1850	307	58		155	8		152	50		50	1	0
Total in 10 Years.	3422	734	22	1753*	130	7	1669†	604	36	51	30‡	8

84. VII. Causes of Small-pox.—i. From the earliest accounts of small-pox to the days of Boerhaave, variola was considered to owe its origin to the same causes, with certain unknown modifications, which give rise to other epidemic maladies, aided by infection and contagion. It was thus believed that small-pox might be generated *de novo*, from some defect or vice in one or more of the six non-naturals—air, aliment, the secretions, exercise, sleep, and mental emotions, but that when thus produced it would spread by infection. Boerhaave was the first to contend that this doctrine was incorrect, and that small-pox was in all cases the product of a specific miasm or poison derived from the same malady. "He acknowledged that the miasm must originally have sprung from some fortuitous combination of common causes, and that what had happened once might happen again, but he held that this contingency was improbable, and might safely be excluded from our reasonings."

85. It is impossible to say, with any degree of confidence, in what source, or in what combination of causes, or under what influences, the poisonous miasm first constituting and afterward perpetuating the disease was produced. There is some reason, however, to infer from what we know of the origin of certain distempers, and of the communicability of them from the lower animals to man, and from the proofs of the causes, and of this communication of these distempers, furnished by the old historians, as shown in the articles Epidemic Influence (§ 12, *et seq.*) and Infection (§ 4, *et seq.*), and by modern pathological and other writers, that this malady, as well as they, originated in the lower animals, and extended from them to the human species by infection or contagion. However this may be, there is no proof that the disease appears or becomes epidemic, after longer or shorter intervals, owing to certain combinations of causes or influences, producing it *de novo*. On the contrary, there is every reason to infer that it is perpetuated by its miasms, or effluvium, or virus, which spreads it by infecting the healthly, either directly or indirectly, by the media of substances—of *fomites*—which preserve, for longer or shorter periods, and thus propagate the poisonous agent (*see art.* Infection, § 16, *et seq.*); and that this distemper has been thus perpetuated since its first appearance in the sixth century. Instances are constantly occurring of either single cases, or of the outbreak of several or of many cases, without proofs of antecedent infection or contagion having been obtained, especially as respects the earliest cases. But as regards these, all the preceding circumstances or occurrences may not be known, or even may not admit of recognition; and as respects many of these, the same or similar circumstances may have taken place to those which occurred in the following case adduced by Dr. Gregory: A child took the small-pox, in the country, under circumstances which seemed to exclude all suspicion of infection. She had never left the house for several weeks; the few neighbours who had called were free from sickness, and no small-pox existed in the neighbourhood. During her convalescence, a looking-glass being put into her hands, she immediately said, "My face is exactly like that of the child at the door, from whom I bought the beads." On inquiry, it was found that some pedlers had passed through the village, and that the child had been to the door, although she had never left the house. Had this child died, or been an inattentive observer, the origin of this attack of variola must have remained forever mysterious.

86. When we consider the facts connected with *infection*, as I have shown in that article, and the long periods during which the infectious miasm may be retained by fomites without losing its specific character and operation, and connect this with the numerous substances which may thus become the media of infection, and with the many occasions on which one or other of these media may have come within the sphere of our senses without our recollection or knowledge—

* Nearly the whole of these 1753 cases were above the age of fifteen years.

† Many of the persons alleging to have been *vaccinated*, but not showing cicatrices, were doubtless duly vaccinated: but to distinguish such cases from the others was impossible.

‡ N.B.—The persons professing to have had small-pox at some former period sometimes announced themselves to have been inoculated, sometimes to have had the casual small-pox, but in no one instance was there any corroborating evidence of the truth of the statement. These cases, therefore, are included in the third column of "*persons unprotected.*"

and, moreover, when the long period which elapses from the moment of exposure to infection to the manifestation of the distemper is taken into account, the frequent difficulty or impossibility of accounting for the infection cannot be a matter of wonder. The poisonous miasm of small-pox is given out from all the mucous, cutaneous, and excreting surfaces—especially the lungs and skin—the exhalations, the secretions, the excretions, the matters in the vesicles and pustules, and the scabs, all contain this poisonous material, with all its specific characters; and this material attaches itself to many dissimilar substances, especially to the bed-clothes, body-clothes, woollen and cotton articles, &c. These, when wrapped up or in any way excluded from the free action of the air, retain the specific miasm for a very long but indeterminate time, and give out this miasm when opened up and exposed to the air.

87. The length of time during which fomites will retain the infectious miasm, with all its properties unimpaired, has not been ascertained; but there is reason to believe that, when they are excluded from the air, this miasm may be preserved for many months, or even for some years. The stages of the distemper during which the infectious emanation is most abundant and noxious have been variously estimated, but without any accurate data. There is every reason to infer that the disease may be communicated by respiring the air containing the morbid effluvium from the commencement of the eruptive fever; and it may be admitted that the infectious miasm is most powerful or concentrated when it is most manifest to the sense of smell. The dried crusts of the pustules, or scabs, not only also possess a contagious quality, but also retain this quality for a very long time, especially when shut up from the atmosphere, or undecomposed; and the dead body possesses also the power of infection, both by the effluvium which it exhales and by the matter in the pustules. How long this power continues after death has not been determined with precision, but it may last from a week to a fortnight, according to the exposure of the body to the air, and to the temperature and humidity of the atmosphere.

88. The distance at which the infectious property may be exerted has been variously estimated by Dr. Haygarth and others. Some suppose that the sphere of infection does not extend farther than a few feet, while others contend that it may extend to many hundred feet. An American physician informed Dr. Haygarth that the infectious effluvium crossed a river 1500 feet wide, and affected ten out of twelve carpenters at work on the other side. The sphere of infection mainly depends upon the state of the atmosphere and the existing epidemic constitution; a still, warm, humid, and impure air extending the sphere of infection; and a cool, dry, and pure air, and free ventilation, circumscribing this sphere, by diluting and dissipating the poisonous miasm.

89. It is obviously of importance to ascertain what degree of cold and heat, or what proportion or amount of chlorine gas, or of the chlorides in solution, is capable of destroying the poisonous miasm or virus contained in fomites, in order that these agents may be employed in disinfecting bed and body-clothes; but our knowledge of the disinfecting powers of these agents, although considerable, requires much greater precision than it at present possesses. There is, however, sufficient reason to believe that a temperature of about 200°, or somewhat above this range, is sufficient to destroy the infectious property, and that these chemical agents produce a similar result in moderately-concentrated solutions.

90. During the last century, and even at the commencement of the present, a singular notion as to the origin of small-pox, and as to the possibility of the entire extirpation of the distemper, was promulgated, and even entertained by some respectable writers, namely, that small-pox was generated *de novo* in infants by the blood of the mother left in the portion of the umbilical cord attached to the fœtus on tying the cord—that the fluids remaining in this portion of the cord being absorbed by the fœtal vessels, thereby contaminated the blood and frame of the infant, and thus developed anew the distemper under consideration, independently of infection or contagion received from any other source. It was therefore recommended by these writers, in order to prevent the generation of the distemper, and ultimately to procure its entire extirpation, that the portion of the cord attached to the fœtus should be thoroughly emulged, and the fluids pressed out of it, upon securing it at delivery. That small-pox neither originated in this source, nor can be extirpated or prevented by any method of managing this operation, will not be disputed at the present day, however great importance may be attached to it in other respects.

91. ii. *The causes predisposing to or increasing the susceptibility of the infection of small-pox* are not wanting in importance.—*A. A very early age* has much influence in predisposing to this distemper. It has been admitted by Dr. Haygarth and other writers that the greatest mortality by small-pox takes place in the early periods of life. In 1795 (before the introduction of vaccination), it was computed that in Chester nearly half the deaths among children below ten years of age was due to small-pox. From the data furnished by Mr. Farr's first and second reports, it appears that out of every hundred who died of small-pox in England, seventy-five were below the age of five years. Of 9762 persons who died of this disease in England in 1837 and 1838, there were 7340 under the age of five years, 1668 between the ages of five and fifteen years, 528 between fifteen and thirty, 210 between thirty and seventy, and 16 upward of seventy years of age. Of 2285 persons who died of small-pox in London in 1840 and 1841, 2060 were under fifteen years of age. During the last quarter of the last century (from 1775 to 1800), that is, prior to the discovery of vaccination, the proportion of the mortality by small-pox to the total mortality was as 8 to 100 in London, and it was probably the same throughout the country. From the commencement of the present century the proportion has varied much, rising in years when small-pox was prevalent, as in 1838, as high as this, and in other years falling far below it.*

* [Ninety-one deaths from small-pox were reported in New York in 1838, of whom sixty-nine were children under 10 years; in 1839, sixty-eight deaths were reported, of whom forty-five were under the same age; and of two hundred and thirty-one deaths from the same cause in 1840, one hundred and thirty-one were under 10. Compare this with the results of vaccination in public institutions, which we give in another place, and the benefits of *vaccine* will be demonstrated. So, also, the registers of

[It appears from the British army statistics that in eight years, from 1844 to 1851, out of a total number of 1,125,854 soldiers, only 745 cases of small-pox occurred, or 66 to every 100,000 men; while among 363,370 sailors there were 417 cases of small-pox, or 115 in every 100,000 men. The deaths from small-pox were only 130 in nearly 1,500,000 men. Among the boys in the military asylum, who are all vaccinated, or have had small-pox, there were only 39 cases and 4 deaths among 31,705; and it appears also that almost as many of these cases occurred in boys who had had small-pox as among those who had been simply vaccinated. All the four deaths were in boys who had had small-pox.—J. G. BALFOUR, *surgeon to the Royal Military Asylum, Chelsea.*

Of 266 cases of admission for small-pox into the Philadelphia Small-pox Hospital, in 1840–1–2, there were, according to Dr. STEWARDSON, 161 of small-pox, of which 41 died; 73 of varioloid, of which none died; and 32 doubtful, of which 3 died. Of these, 79 were whites, of whom 22 died; and 82 blacks, of whom 19 died—the proportionate mortality being very similar. Of the whole number, 113 were unprotected, of whom 30 died; 99 had been vaccinated, of whom 4 died; 51 doubtful, of whom 10 died. The variolous disease was mild, and the pocks few in number.—*Am. Journ. of Med. Sci.*, vol. v., N. S., p. 80.]

92. The susceptibility of infection exists in all persons who have not had the disease, and who have not been vaccinated, but in various degrees: it is greatest in infancy and childhood, and least in advanced age. Dr. GREGORY, however, thinks that this greater mortality from small-pox does not depend upon a greater susceptibility of infection, but because the disease is usually contracted on the first exposure to the infectious miasm. There can be no doubt of this being the case, but it is chiefly owing to the susceptibility being so remarkable at this age. Numerous exceptions have, however, been remarked to this general susceptibility. Both before and after the introduction of inoculation, many persons were frequently exposed to infection without experiencing the disease; and this circumstance, which is common to all infectious and pestilential maladies, was most ignorantly urged by non-contagionists as an argument against the existence of an infectious property; they either not adverting to, or concealing the fact, that many of those who thus appeared quite unsusceptible of infection had the disease communicated to them by inoculation. "A lady, in 1804, was successfully inoculated for small-pox at the age of 83, and lived several years afterward. She had brought up a large family, most of whom she had attended in attacks of small-pox, but had never taken it herself." I shall have to show in another place that the susceptibility which, in vaccinated persons, is destroyed for some years, returns with advancing age, and becomes greater as life advances.

93. *B.* The several causes which predispose the system to the infection of other pestilential maladies have a similar effect in spreading small-pox. Of these the most manifest are diathesis, or peculiarity of constitution; humid and warm seasons and states of the air; a close and stagnant, or impure atmosphere; fear of infection; an endemic or epidemic constitution, favourable to the diffusion or operation of the poison: arrival from a pure and healthy air into a locality in which the malady is prevalent; and the constitution of the Negro and dark races.—*a.* A delicate conformation and susceptibility of the nervous system, a scrofulous or other diathesis existing in families, and exhaustion or depression by previous disease or other causes, either predispose the frame to infection or render the malady more severe.—*b.* A high range of temperature,* especially when conjoined with humidity, stillness, and impurities, arising from animal or vegetable decomposition, both predispose the frames of those who are subjected to these causes, and concentrate the poisonous miasm emanating from the sick, and spread this miasm in a wider sphere.—*c.* Fear of being attacked, by depressing vital power, lays the body more open to the invasion, as in all other pestilential maladies.—*d.* There is something in the state of the stationary epidemic constitution which certainly influences variola and other epidemic distempers, and which we are unable to demonstrate otherwise than in the characters of its results; but although the epidemic prevalence of small-pox may be limited to a particular place, or extended over a whole country, either in cold seasons or weather, or in warm seasons and countries, yet it is most severely and generally prevalent in these latter circumstances.—*e.* The constitution of the dark races evinces a remarkable susceptibility of

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the Northern and Northwestern Dispensaries of New York show that of five hundred and forty-nine variolous cases (variola and varioloid) treated in those institutions, ninety-three, or 17 per cent., were one year old or under; one hundred and sixty-three, or 30 per cent., from one year to five; one hundred and twenty-six, or 23 per cent., from five to ten years; one hundred and four, or 19 per cent., from ten to twenty; fifty-four, or 10 per cent., from twenty to forty; seven, or 1.3 per cent., from forty to sixty; and two, or 0.6 per cent., over sixty; showing that 47 per cent. were five years old or under. Taking the whole city of New York, sixty-four per cent. of small-pox deaths, during the past five years, have been under the age of five.]

* BOERHAAVE, one of the ablest illustrators of the pathology of small-pox, states, "Est ut plurimum epidemicus, verno tempore primo incipiens, æstate crescens, languens autumno, hyeme sequente fere cedens, vere iterum eodem ordine rediturus." The truth of this was shown in the course of the Norwich epidemic of 1819, when a few cases only were observed in the preceding winter, and the greatest prevalence and mortality were in June and July. Small-pox was introduced, also, into the town of Lynn at the commencement of this year, but did not spread with rapidity until summer. A knowledge of this circumstance induces the native inoculators in the East to inoculate the small-pox in the cool season.

[There is no good reason for believing that the weather or seasons have such influence on this disease, as stated by Dr. C. Taking the mortality from small-pox in New York, from 1816 to 1853 inclusive, the result shows for January, 661 deaths; February, 531; March, 559; April, 309; June, 380; July, 288; August, 243; September, 194; October, 269; November, 370; December, 521. Spring, 1217; Summer, 911; Autumn, 833; Winter, 1713. Showing that the greatest mortality is in the winter, and successively less in the remaining seasons; the deaths during the autumnal months not being half as great as during the winter. Though we have had occasional mild epidemics of small-pox in the summer, those attended with much fatality have uniformly commenced in the fall, or at the beginning of winter. The same is observed by SYDENHAM as occurring in his time. The contrary, however, has been observed in some instances. At present, there is every reason to believe that small-pox is quite independent of cognizable climatic conditions, such as the temperature, density, and humidity of the atmosphere. There doubtless are unknown atmospheric conditions, especially as connected with its electrical state, &c., which influence the susceptibility to variolous contagion, but what they are must be determined by future observations.]

variolous infection. The destructive epidemics which have occurred in warm climates and in the Western World illustrate this fact. Although in many of these much may be attributed to the high range of temperature, humidity, and other concurring causes, nevertheless much more should be assigned to peculiarity of constitution, as evinced by the remarkable prevalence and fatality of the distemper when introduced into America among the natives of all climates and localities in that quarter of the globe.

[The Annual Reports of the City Inspector of the city of New York, for 1824, 1830, 1834, 1839, 1841, 1842, and 1844, show that 19.6 per cent. of all who died of small-pox were coloured, while only 7.8 per cent. of the total mortality was in this class.]

94. *C.* There are certain circumstances, *apart from vaccination*, which influence not merely the susceptibility, but also the character of the malady. Those just mentioned (§ 91, *et seq.*), while they increase the former, have generally a very remarkable influence in augmenting the quantity of the eruption and the severity and malignancy of the distemper.—*a.* The character of the case generating the infection has no influence upon that produced by it, whether the infection has taken place through the medium of the lungs or by inoculation; a discrete case may occasion a confluent or malignant one, or this latter the former. This may arise from the susceptibility, or constitution, or diathesis of the infected, or from the quantity or concentration of the poison inhaled in a tainted atmosphere. The general mildness of the distemper, when inoculated, may be the result of the small quantity of the poison which may be administered in this way.—*b.* The best state of health, or vigour of constitution, may favour the occurrence of infection, but it will also favour the appearance of a mild form of the disease; while unhealthy or cachectic states of the frame, or some pre-existing disorder, may diminish the disposition to be attacked, and yet may render the distemper more severe or malignant when the infection is once produced.—*c.* Certain physical and other influences or circumstances may concur with the first manifestation of disorder to render variola mild, or discrete, or confluent, or malignant. Some of these, especially high temperature and impurity of the air, have been already noticed (§ 93), as tending to aggravate the malady. Whatever determines the circulation to the surface, as warm baths, cordials, a heating regimen, too many bed-clothes, stimulating diaphoretics, a plethoric habit of body, and external irritants, increase the quantity, or favour the confluence of the eruption; while a cool, dry air, large and well-ventilated apartments, a cooling regimen, and active purgatives, taken during the latent period, or at the commencement of the primary fever, diminish the quantity of eruption, determine the circulation from the external surface and lower febrile action. Vascular plethora, especially if accompanied with more or less excrementitial accumulations, favour not merely a confluent or malignant form of the distemper, but many of the complications described above (§ 44, *et seq.*). Extreme debility, weakness of constitution, and anæmia, delay the eruption, and impress the malady with a nervous or asthenic character.

95. *F. Epidemic visitations* of small-pox observe several of the same laws as govern the recurrence of other epidemic pestilences: 1st. They return to a locality after a varying number of years, the intervening years presenting merely a few cases. This may, in some measure, be owing to the numbers of susceptible or unprotected cases having become, after many years, so numerous as to furnish a sufficient supply to an epidemic outbreak; the straggling or few cases usually met with readily extending the infection to the accumulated mass of susceptible persons, as soon as states of air and other influences concur to predispose their constitutions to this result.

96. 2d. These visitations are characterized by greater severity, and are attended by a greater mortality, than when the disease occurs in solitary instances, or when it does not assume an epidemic prevalence: this may be owing to aërial or other causes having predisposed the constitution of susceptible or unprotected persons to severer attacks, and partly also to more concentrated states of the poisonous miasm conveyed by the air from the sick to the healthy. It is thus not uncommon to find persons who have been exposed to the infection of small-pox on ordinary occasions without being attacked, who nevertheless are seized by the disease in the severest form when it is epidemic.

97. 3d. Small-pox epidemics, like others, have a more or less gradual increase, and, when they reach their height, a gradual decrease. The rapidity of progress towards their height and their disappearance necessarily depend upon the population of districts where they break out, upon the numbers of susceptible persons, upon the communications, direct or indirect, between the sick and healthy, upon the observance of segregation, upon the rapidity with which the susceptible are infected, and upon the prevalence of the atmospheric and other concurring influences to the formation of an epidemic constitution, either in a limited locality, or in a more extended sphere.

98. 4th. Small-pox differs from other pestilences, inasmuch as that it may be propagated at all seasons of the year, and in very different atmospheric conditions, although with varying grades of rapidity and prevalence; whereas other infectious pestilences, as I have shown when treating of these, require certain ranges of temperature for their epidemic prevalence, or even for their contingent or possible communication. But small-pox, like scarlet fever and measles, although favoured more or less by temperature and season as these are, may prevail at any season in temperate countries, and more especially in the British Isles, yet the more general and most severe epidemics appear during warm seasons, or when a high temperature and much moisture in the air favour predisposition of constitution and the concentration of the poison. This compatibility of infection with any season and range of temperature incidental to temperate countries, accounts for the circumstance of small-pox, as well as scarlet fever and measles, being a domiciliated malady in these countries, although occurring after longer or shorter intervals in epidemic forms of prevalence and severity, as the numbers of unprotected persons become increased, or as the protection of vaccination wears out.

99. 5th. Epidemic small-pox may be local, owing to local circumstances and influences, as occurred in Norwich in 1819, when, between the months of May and October, about 530 persons died of the distemper within the limits of the bills of mortality, which do not include several parish-

es in the immediate neighbourhood, where it also prevailed. The limited occurrence of small-pox epidemics is often owing to the combination of morbid influences existing in the locality thus visited. In Norwich and other places, as Edinburgh, Glasgow, Lynn, Liverpool, &c., where such epidemics appeared, many, if not all the elements of an epidemic constitution already existed, and favoured the spread of the distemper, either from isolated cases, or from an introduced infection or fomites.

100. 6th. Not only may persons be seized with small-pox, during its epidemic prevalence, who had previously escaped, although exposed to infection (§ 95, *et seq.*), but also persons who have been vaccinated, and who, after long periods, have been revaccinated, and even inoculated with small-pox without effect, may on such an occasion be attacked by variola. This was observed by Mr. Crosse in the Norwich epidemic of 1819, when the protective influence of vaccination may be presumed to have been greater than now, a shorter period having elapsed in most cases since the process was adopted. The small-pox thus following vaccination, after periods of different durations, but generally upward of seven or eight years, although more or less modified, and commonly modified in proportion to the shortness of the period which had elapsed from vaccination, cannot be mistaken for any other eruptive disease, for, independently of the character of the eruption, inoculation with the matter from the vesicles of the modified malady has produced regular small-pox in the unprotected, as was shown by Mr. Crosse and others. It is chiefly during small-pox epidemics that the protective influence of vaccination is tested, and it is then that the amount and duration of this protection, in connexion with proofs of an efficient and healthy vaccination, can be duly estimated. (*See art.* Vaccination.)

101. 7th. As I demonstrated with respect to scarlet fever, when epidemic, that that malady sometimes presented a most dangerous form, in which there was no eruption, and sometimes even no sore throat (*see* Scarlet Fever, § 26, *et seq.*), so it has been observed that an analogous form of small-pox occurs in some severe epidemics, especially in places where all the elements of epidemic severity concur to produce great malignancy. Thus it is recorded by Mr. Crosse, in his history of the Norwich epidemic of 1819, that a number of cases of fever with petechiæ, but without any variolous eruption, appeared in May, June, and July, when the epidemic was at the worst, and all terminated fatally. The victims were mostly children, enfeebled by scrofula, or some other disease; and as several were thus seized, while others in the same family were suffering from small-pox, and as no case of this kind occurred in any one who had previously gone through small-pox, Mr. Crosse ascribed (and, in my opinion, very justly) every case of it to the variolous infection.

102. 8th. Before the introduction of inoculation into Europe, and when variola appeared only in its natural form, the epidemics of it which occasionally appeared, especially when the numbers of the unprotected, by a previous attack, became greatly increased, were often most destructive and pestilential. The outbreaks of small-pox in London in former times frequently carried off several thousand persons in a few months. In 1720, upwards of 20,000 persons were said to have died of it in Paris; and Horstius states that the epidemic visitations of variola "aliquandò adeò sævæ et malignæ sunt, ut instar veræ et legitimæ trucis pestis in omnem ætatem et sexum grassentur et fervirant cum multorum jacturâ et perditione;" and that in 1614 it ravaged most of the countries of Europe more destructively than the plague, "in summâ nulli parcentes regioni, unius anni curriculo totam Europam seriatim visitârunt atque enormiter depopulârunt." It may readily be conceived that, when the distemper appeared in a district or city, after an absence of many years, when the greater number of the inhabitants were unprotected, its spread would be rapid, and its ravages great. The mortality in the epidemics which occurred previously to the introduction of inoculation must have been very great, when we consider the efficient and concurrent elements of epidemic prevalence and fatality which every where existed in those times, and the nature of the treatment generally adopted. Even in recent times, the proportion of deaths to the number attacked by natural small-pox in several epidemic visitations of the distemper has varied from one in six to one in four.

103. 9th. *The possibility of persons being attacked by small-pox a second time* has been contended for by many, and doubted by others, as Mead, Heberden, Monro, De Haen, &c. De la Condamine estimated second attacks as one in ten thousand. While admitting the possibility of a second attack, I doubt if its occurrence be even so frequent as here estimated. It is only when the disease is epidemic, and the exposure to the infectious miasm has been prolonged, or the poison has been concentrated in the respired air, that it may occur. Dr. Gregory states that very few persons ever present themselves at the Small-pox Hospital who have affirmed that they had previously undergone the disease, and of these few but a very small fraction can stand the test of rigid scrutiny. In one of the last cases that occurred, the medical man who witnessed the first seizure had misgivings as to the true nature of the case. No instance is recorded of the same person having been admitted twice at the Small-pox Hospital. As to second attacks of variola, there are several sources of error. Sometimes the first attack is incorrectly reported, sometimes the second. The same medical man very rarely has seen both attacks. Chicken-pox is very frequently mistaken for variola, and even psora, ecthyma, and even pustular syphilis, have given origin to mistakes. The case of recurring variola which made the greatest noise was that of Louis XV., who died of small-pox in 1774, at the age of 64, after having, as it is alleged, undergone that disease casually in 1724, when 14 years of age. But the physicians who attended him in this first attack were not agreed as to its having been small-pox; and it was known that he was abroad and well six or seven days after the eruption was out, farther evincing the non-variolous nature of the attack. I therefore agree with Dr. Gregory in believing that the primary disorder which his majesty had was varicella.

104. VIII. Of the Inoculation of Small-pox.—Inoculation having been abolished by act of Parliament, and the end held in view having been more satisfactorily obtained, as generally supposed, by having recourse to vaccination, it may appear unnecessary to many to make inocu-

lation of small-pox a topic of discussion at this time. Yet when all the evidence connected with the comparative merits of inoculation and vaccination in temperate and warm climates, and in different races of the species, is duly considered, some notice of this still not unimportant topic should not be omitted. At the time of my writing this, just half a century has elapsed since the discovery and introduction of vaccination; and after a quarter of a century of most transcendental laudation of the measure, with merely occasional whisperings of doubt, and after another quarter of a century of reverberated encomiums from well-paid vaccination boards, raised with a view of overbearing the increasing murmurings of disbelief among those who observe and think for themselves, the middle of the 19th century finds the majority of the profession, in all latitudes and hemispheres, doubtful as to the preponderance of advantages, present and prospective, to be obtained either from inoculation or from vaccination. In 1823, I stated in the *London Medical Repository* (see the Refer., &c.), from evidence which had come before me in families which had suffered in numbers from small-pox, that the protection afforded by vaccination was impaired by years, and wore out in twelve or fourteen years, or in a longer or shorter time, according to diathesis, &c.—that vaccinated persons were liable to small-pox, in a more or less modified form, after some years, say nine or eleven; in a mild but distinct and fully developed form in from twelve to fifteen years, and to the usual states of the distemper, according to diathesis, to exposure, to infection, and epidemic prevalence, after this more advanced age. What was then predicted has since been so generally fulfilled, that revaccination has been adopted in many places, and has often failed, natural small-pox having notwithstanding appeared in the revaccinated—both in those in whom the measure appeared to have succeeded and in those in whom it failed.

105. Thus half a century has brought us to the position that we are doubtful which to prefer —vaccination, with its present benefits and its future contingent dangers, or inoculation, with its possible present dangers and its future advantages. If there were no other considerations but these which could be seriously raised in connexion with the inoculation of variola, I should, for my own part, and after a due consideration of the subject in its various bearings, be at no loss which to select for those for whom I feel the interest connected with the nearest relationship; but there is the contingent and not improbable diffusion of the variolous poison to the unprotected by inoculation to be taken into account; and there is obedience also to the laws, which is the duty of every good citizen, and is strictly observed by every well-educated physician, although systematically disregarded and trespassed by pretenders and irregular medical practitioners. Another half century, the end of the nineteenth century, will, I fear, find the physician no longer in doubt as to which he will choose, even in this climate, as he no longer can be in doubt in India and other parts of the East, and as respects the dark races, unless he be influenced by authority and prejudice—influences which are equally unworthy the high position in which his profession places him in the estimation of those whose opinions alone deserve respect and consideration.

[The profession in the United States do not participate in the skepticism manifested by Dr. Copland in regard to the prophylactic powers of *vaccinia*. Statistics, as we have shown elsewhere, gathered both from private practice and observation in hospitals, orphan asylums, and other public institutions, prove beyond all doubt the vast superiority of vaccination over inoculation, and the unspeakable value of the former as a prophylactic measure against small-pox. Hence, in many, if not all, of the states, there are laws prohibiting inoculation, and these laws have doubtless done much good in preventing the spread of small-pox contagion. There is no doubt whatever in the minds of American physicians which to prefer, inoculation or vaccination, for statistics have settled the question in favour of the later. Vaccination has not been lauded above its merits: were the public less skeptical than they are in regard to its advantages, especially the poorer classes, we should hear far less of the ravages of small-pox than we do at present. The question of the success of vaccination has been repeatedly raised, but investigations, carefully conducted, have all resulted in its favour. These doubts were thought worthy of investigation by the French *Royal Academy of Medicine* a few years ago, and a commission was appointed by that body charged with the examination of the facts bearing on the subject. In a very candid and elaborate report, M. Paul Dubois, secretary of the commission, demonstrated that, though vaccination fails under some circumstances, it nevertheless modifies, in almost every instance, the variolous affections, when it does not entirely preserve individuals from an attack of the disease. The modifying influence of *vaccinia* is so great in the United States, that it has been estimated that among individuals vaccinated that are attacked with variolous disease not one per cent. are fatal, while one half of the non-vaccinated who take the disease die.—(Billard.) But one death from small-pox after vaccination occurred in Philadelphia in 1827, among 80,000 vaccinated persons, during the prevalence of a malignant and mortal small-pox, while several persons lost their lives from it who had already had the disease.]

106. *Inoculation of small-pox* is the artificial insertion beneath the cuticle, or in a wound or puncture, or the application on an abraded surface of a person not previously attacked by small-pox, of a minute portion of the virus formed in the vesicles or pustules of one labouring under the malady. By this mode of communicating the malady, the system is generally infected by the smallest quantity of the poison capable of producing this effect. In the East, inoculation has been practised successfully, and in a rational manner, from a remote period—as remote as the history of the disease carries us. The following arguments have been adduced in favour of it, and, previously to the discovery of vaccination, powerfully recommended it; and even now they should be calmly weighed against the advantages of vaccination, as far as these have been yet ascertained, and as they may be valued prospectively.

107. (*a*) All persons not protected by an attack of small-pox are liable to be seized with this distemper at any period of life, in every circumstance in which they may be placed, and on any occasion. It therefore behooves them to obtain this protection as early as may be consistent with a safe and efficient recourse to it. Now, this pro-

tection was formerly inoculation; more recently, and at present, the only legal protection is vaccination. The former communicated a milder form of the same disease as a certain protection; the latter transmits an affection of a slight and by no means dangerous nature in itself, which is somewhat similar in certain respects, and which has the virtue of preventing an attack of small-pox for some years, and of rendering such attack milder in grade and modified in character for an indefinite period; this protection, however, is not durable, but terminates after an indefinite number of years, in some instances entirely exhausting itself, and leaving those who may consider themselves protected open to either a mild and modified, or a confluent, severe, or even fatal attack of the malady.

108. (*b*) The individual and collective evils resulting from the infection of natural small-pox, whether appearing in scattered or rare cases, or breaking out with pestilential prevalence, are well known. The history of small-pox epidemics, as observed in communities furnishing numbers of unprotected persons, sufficiently demonstrates the devastation which followed the entire want of any protecting power before the introduction of inoculation into Europe. When this protection was introduced, its influence was manifest, not only in respect of the persons who had recourse to it, but also as regarded the community, in diminishing the frequency and fatality of epidemic small-pox, and in furnishing protected persons to attend upon the infected. Still, there was a certain amount of evil connected with this mode of protection. The chance of communicating a dangerous or even fatal malady, and the contingent propagation, from the inoculated individual to the unprotected, of this disease, dismayed many, and furnished arguments in former times against having recourse to it. When weighed in connexion with the fact that some few entirely escape small-pox during their whole lives, although these were admitted to be very few, many were induced entirely to neglect this mode of protection, and, in more recent times, to adopt a milder method, and one which appeared to the public and to the profession, until lately, equally efficacious and permanent.

109. The chief objections here urged against inoculation were partly specious and partly just. Inoculation practised by ignorant, unskilled, and unprofessional hands, in improper seasons, ages, and circumstances, or with a total disregard of the states of health of those subjected to it, may occasionally be followed by dangerous or even fatal results. Nevertheless, it has been shown that, with all these drawbacks, and without the precautions, the science, and the care which the educated physician can employ, the proportion of deaths among the inoculated does not rise above 5 in 1000. That inoculation would spread the distemper is certainly true when a few only resort to it; but even such diffusion would prevent the recurrence of those pestilential epidemics which follow the accumulation of a great number of unprotected in one locality, and would diffuse the disease in a milder form than when it occurs epidemically; for it has been fully proved that infection from the inoculated distemper generally does not communicate so severe or dangerous an attack as infection from a natural and epidemic case. Besides, if inoculation were generally adopted at a proper age, there could not possibly be the pabulum for an epidemic outbreak, and scarcely the occurrence of a natural case.

110. (*c*) Against this admitted amount of unfavourable contingency must be placed the firm confidence of protection which inoculation furnished to all persons, in all climates, and to all races within the tropics, and to the dark varieties of the species. In these climates and races vaccination (which the law has made to supersede inoculation) has been demonstrated to be inefficacious; but in all these circumstances, however diversified or opposite, inoculation has been found, and still is found, the most certain protection from the severer distemper and from epidemic outbreaks.*

111. (*d*) Several *unfavourable contingencies have been urged against inoculation;* but certain of these need not be apprehended. That this measure may communicate a severe, a disfiguring, or even a fatal malady to a person who may entirely escape it if inoculation were not performed, must be admitted; but this argument was without weight before the introduction of vaccination, and now the advantages of the one mode of protection should only be weighed against the other with the view of adopting either of them, for the neglect of both is manifestly not merely improper, but even criminal. It has been urged that inoculation may not only be followed by a dangerous attack, but that it may develop other maladies, especially severe affections of the eyes, terminating in blindness, and diseases of various organs; but these would more certainly follow the natural infection of small-pox, which, without either inoculation or vaccination, could very rarely be avoided. To these contingencies vaccination is certainly not liable; but it should not be overlooked that scrofula and tubercular formations are more frequently observed after vaccination than after inoculation (see *art.* Scrofula, &c., § 48, 49). The risk of a second attack after the inoculated small-pox has been urged; but this risk hardly exceeds a possibility, and should not be taken into account; the risk of being attacked after vaccination, or even after revaccination, being infinitely greater, especially during adult and advanced age. (See *art.* Vaccination.)

112. (*e*) It has been urged by Dr. Baron and others, who are the most determined supporters of vaccination, that "the practice of inoculation, the greatest improvement ever introduced in the treatment of small-pox, although beneficial to the person inoculated, has been detrimental to mankind in general. It has kept up a constant source of noxious infection, which has more than coun-

* Between December, 1849, and April, 1850, inclusive, 76 cases of small-pox were admitted into the General Hospital, Calcutta. Of these 20 died. Of the 76 admitted, 66 had been vaccinated. Of the 66 vaccinated, 41 had good cicatrices, and 25 had cicatrices not so well marked. Of the total 76 cases, 30 were severe and confluent, and 46 mild or modified. Of the 10 unprotected cases, 5 were severe and confluent—of whom 4 died; and 5 were mild. Of the remaining 25 confluent cases, after vaccination, 12 had good cicatrices, and 13 cicatrices not so well marked. Of those that had been vaccinated in early life, 16 died, of whom half bore good scars, and half had scars not well marked. Of the whole number, 65 were males, and 11 females; 8 were children aged five years or under, of whom 1 died. Six of these children had been vaccinated. The mortality here stated as occurring from variola after vaccination—16 out of 66, or 24 per cent.—is the highest upon record in any country, and must be attributed either to the malignity of the prevailing epidemic, to the climate and locality, or to the influence of race—probably, in part, to all these.

terbalanced the advantages of individual security."—(*Life of Jenner*, vol. i., p. 260.) This is true only to a certain extent; for if all were inoculated early in life (as by law might be enforced), there could be few or none liable to the natural infection and epidemic visitation of the malady; and according to the numbers unprotected would be the risk of such infection and visitation. Inoculation, although practised the most during the last half of the 18th century, was nevertheless as often neglected or put off, until it was too late to prevent the natural infection, and hence all reasoning respecting it became inconclusive, especially in local and other circumstances, respecting which the particulars were either imperfectly known or altogether unknown.

113. Sir G. Blane has endeavoured to show that the proportion which the mortality by small-pox in London bore to the general mortality increased during the last century from 78 to 94 per thousand, and that the diffusion of small-pox by inoculation was more strongly exemplified in the country than in London; since there are many places where small-pox was not known for twenty, thirty, and even forty years, in which at present scarcely an adult can be found who has not had it. These arguments are, however, more specious than solid. For, as respects London, the increase of population, the diminished prevalence of all other diseases, and the prevalence of epidemic small-pox, are not duly estimated. From 1711 to 1740, when there was no inoculation, the deaths by small-pox were 65,383; from 1741 to 1770, when inoculation was coming into use, the deaths were 63,308; and from 1771 to 1800, when inoculation was the most frequent, the deaths were 57,268. The increase of population during these periods should not be overlooked. As to the escape of many places for many years, upon which Sir G. Blane has laid so much stress, it should be known that such places were always visited at last, and without exception, by most destructive epidemics, the great number of the unprotected furnishing an abundant papulum for their malignant and fatal prevalence. It becomes, therefore, much preferable to have, even in these places, the regular adoption of inoculation by qualified persons, with even the highest rate of mortality consequent upon this measure, than the immunity of many years, with a mortality of 25 or 30 per cent., as recorded of these epidemics.

114. There can be no doubt that early in, and about the middle of, the last century, when inoculation was adopted only by a few, and even afterward, when inoculation was very irregularly practised, and when many, even the majority in many places, were left without that protection, that it multiplied the sources of infection; but this was merely a powerful argument then for universal inoculation, as it is now for the adoption either of vaccination or of inoculation, if the latter were allowed by the Legislature. On this subject, as will more fully appear when vaccination comes under consideration, writers have been partisans, rather than calm examiners of facts, as formerly or at present observed, and as faithful expositors of what may rationally be expected.

[We fear that the above statements of our author rest on very insufficient proof. Statistics carefully collected in this country and Great Britain lead us to a different conclusion. While recurrent small-pox appears to be one of the rarest events, it must be admitted that small-pox after vaccination, among adults vaccinated in infancy, is by no means uncommon. If we take, for instance, the records of the London Small-pox Hospital for the last eleven years, we find that 4090 persons have been admitted having small-pox, of whom 2168 had been vaccinated and 1924 unvaccinated, and that more than one half of those admitted had been vaccinated in early life. The majority were of adult age, a few between nine and fifteen; but below the age of nine scarcely any vaccinated person was admitted; thus showing that the susceptibility to the variolous miasm among vaccinated persons increases as life advances, while the reverse holds true in regard to the unvaccinated. In 1850–51, the total number of cases of small-pox admitted was 976, of whom 162 died, being at the rate of 16 per cent. Of the 976 admitted, 41 were infants below the age of five, all unprotected, of whom 22 died; 101 were children between five and fifteen—majority unvaccinated, of whom 25, or one quarter, died; 685 were adults from fifteen to thirty; 109 beyond that age. Total, 794 adults; the larger proportion of these had been vaccinated, of whom 115 died, or 14 per cent. Of the total number admitted —976—613 professed to have been vaccinated; 569 exhibited cicatrices; of the latter, 25 died, or 4 per cent. In 1851, the proportion of persons admitted after vaccination amounted to 65 per cent., while in 1841 it was only 44 per cent., the increase being, doubtless, attributable to the extensive diffusion of vaccination. But the mortality at the same hospital, during the last two years, among the vaccinated cases, according to Dr. Gregory, has only slightly exceeded 4 per cent. This is a question, however, which cannot be accurately settled by hospital statistics and experience, inasmuch as the patient is not often as favourably situated, as regards recovery, as in private practice; for it has been shown by Dr. Gregory that in one sixth of the whole number of fatal cases there were symptoms of superadded hospital disease, especially erysipelas facialis. Thus mild cases are, under hospital influences, rendered severe; discrete cases become confluent, and the general mortality is increased.

Compare the following table of Dr. Gregory's, in the *Medical Times* for 1849, with returns from private practioners:

	Total.	Deaths.	Per Cent. of Deaths.
Unprotected cases.....	254	103	40
Vaccinated { with cicatrices	365	38	10
Vaccinated { without do. ..	63	25	39
Total vaccinated.....	428	63	14
Previously inoculated	3	1	33

Thirty returns from private practitioners gave,

	Total.	Deaths.	Per Cent. of Deaths.
Natural small-pox in unprotected cases	1731	361	20.85
Small-pox after vaccination	929	32	3.44

In a Report of the Norwich Board of Health, in a severe epidemic of small-pox, which occurred in that city in 1845, it is stated that the mortality from small-pox in the unprotected was 12½ per cent., and in the vaccinated only 3 per cent.; and it was very doubtful, in the latter class of cases, whether all had been properly under the influence of small-pox. The same report gives the result of the personal visitation of 531 fami-

lies, comprising 2170 individuals. Of these, 1664 had small-pox, of whom 1536 had not been vaccinated, while of 506 who escaped only 84 had not been vaccinated. During the last year, the Epidemiological Society of London had received 430 replies from medical practitioners in the United Kingdom to questions sent out regarding the prophylactic power of vaccination, and out of this large number only one expressed any doubt respecting the protective power of the vaccine disease. And such, also, has been the uniform opinion expressed in the annual returns by medical officers to the Poor-law Board of Great Britain; but, as Dr. Gregory has suggested, this is a question which can only be finally settled by an appeal to facts, and to the experience of long periods resting on large data. Thus, according to Dr. Gregory, the average of deaths from small-pox in London per 1000 deaths, for the ten years ending 1752, was 89; for the 10 years ending 1756, 95; for the 10 years ending 1770, 108; for the 10 years ending 1780, 107; for the 10 years ending 1790, 94; for the 10 years ending 1800, 77; for the 10 years ending 1810, 63; for the 10 years ending 1820, 41; for the 10 years ending 1830, 32; for the 10 years ending 1840, not known; for the 10 years ending 1850, 16; average number of deaths from small-pox per annum in London, for the 10 years ending 1750, 2036; for the 10 years ending 1850, 498. The number of deaths from small-pox in the former period is to the latter as 4 to 1, while the population of the former period was to the latter probably as 1 to 4.

According to Caspar (*Med. Statistics*), we have the following results obtained in Prussia:

	Total Deaths.	Small-pox Deaths.	Per 1000 Deaths.	Ratio.
1783–1791=8 years,	47,367	4315	91	10
1814–1822=8 "	51,389	535	10.5	1

In 1825, the mortality from small-pox in Prussia was 5.8 per 1000 of all deaths; in 1834, 15.6 per 1000; in 1843, 10.2; and in 1849 but 3.5 per 1000 of the total deaths, which, during the last year mentioned, were 498,862, out of a population of 16,000,000, showing that small-pox was 37 times more fatal in Prussia in 1803 than in 1849. Of 435 medical men to whom queries were addressed by the Epidemiological Society of London in 1853, 266 state that they had been vaccinated, much exposed to small-pox, and had escaped; 34 had been vaccinated, not much exposed, and escaped; 38 had been vaccinated, and taken small-pox; 69 had been inoculated, and escaped small-pox; 5 had been inoculated, but taken small-pox; 3 had been inoculated, but taken cow-pox accidentally; 20 had been neither vaccinated nor inoculated, and had taken small-pox; and, with the exception of two, all the cases of small-pox after vaccination had been mild, and one case of small-pox after vaccination was severe. Of 356 replies from medical practitioners in Great Britain, 182 state that they have never seen a case of death from small-pox after vaccination; 3 state, respectively, that the cases have been "few," "very few," and "frequent;" 44 give an aggregate of 70 deaths; 127 give no statement of their experience on the subject.

The following table gives the experience of 30 practitioners on the respective mortality of, 1st. Natural small-pox; 2d. Small-pox after small-pox; 3d. Small-pox after vaccination:

	Cases.	Deaths.	Per Cent. of Deaths.
Natural small-pox	1731	361	20.85
Small-pox after small-pox ..	58	22	39.92
Small-pox after vaccination .	929	32	3.44

In 7 of the cases of death after vaccination, the evidence of vaccination was not satisfactory, and in 6 others the deaths are ascribed to superadded diseases. Great stress is laid in the above replies to the manner in which vaccination is performed; on the importance of fresh and efficient lymph, and careful watching of each case. There is no satisfactory proof that vaccination has failed to produce the great results anticipated by its advocates. The mortality from small-pox is due to the neglect of vaccination, or the carelessness with which it is performed, not to its failure, as appears from the above statistics. In Great Britain, the highest number of vaccinations under one year amounts to only about 33 per cent. of total births, and in many parts of the kingdom it is not two per cent.; and in this country the average proportion is still less. And yet England has a national vaccine institution, and acts of Parliament for the promotion of vaccination; and while in Prussia, Sweden, and other continental nations, legislative authority has undertaken to enforce general vaccination among the people, still there are, in spite of every precaution and exertion, thousands of unprotected persons among the poor and improvident, ready to become victims of small-pox whenever exposed to its epidemic or contagious influence.

Statistics bearing on this subject in this country fully sustain the conclusion adopted by the Committee of the Pennsylvania Medical Society, in 1852, that "no circumstances exist to justify the general substitution of inoculation after the fifteenth year of age, as proposed by Dr. Gregory," and that "vaccination still offers the only dependence for protection against small-pox."]

115. *There are a few rules requisite to the safe conduct of inoculation* that ought to be observed: 1st. This measure should be employed for persons in good health — in those who are neither debilitated, nor plethoric, nor obviously scrofulous. Debilitated persons should previously be restored to health, and the plethoric reduced by moderate evacuations and active exercise. All the secretions and excretions ought to be natural and free; and wherever a cachectic state of system, or indications of visceral congestion or obstruction exist, inoculation ought not to be performed. 2d. It may safely be practised at any age from three months and upward, but it should not be resorted to during pregnancy and the puerperal state, on account of danger to the mother and child, nor during lactation. 3d. It may be practised at all seasons in temperate countries, and in all climates. The preferable season is that which is moderately cool, and admits of due ventilation of the patient's apartment. In warm climates, the coolest season of the year should be selected; and this season has always been selected by native inoculators in the warm climates of the East, where inoculation has been adopted from early ages. 4th. Inoculation is successful, compared with the natural distemper, in all races and climates, but more especially in the dark races and in tropical countries; for although the proportion of deaths after inoculation may be higher in the dark than in the white races, the protection furnished by it is even greater in the former than

in the latter, natural small-pox being so remarkably destructive in all dark races

116. That variolous inoculation by unqualified persons ought to be prevented by legislative enactment cannot be disputed; but there are circumstances which may render recourse to it, under due precautions, a justifiable measure, especially the following: 1st. When small-pox unexpectedly breaks out in a district at a time when vaccine virus is not to be obtained. 2d. When persons who have been vaccinated in infancy are about to proceed to intertropical climates, and are likely to visit places where small-pox either prevails or recurs epidemically. 3d. Among the dark races, when they will not adopt vaccination, or when the vaccine virus is inefficient, either as respects its local effects or its protective power. 4th. When persons are insusceptible of vaccination, from peculiarity of constitution or some other cause.

117. In the present state of our knowledge as to the protection furnished by vaccination — believing that this measure will never be generally adopted, and that, if it were so adopted, it could never altogether banish small-pox, nor prove a complete or lasting preventive of variolous infection — it becomes doubtful whether or no the amount of benefit conferred by vaccination will hereafter prove greater than would be furnished by the general adoption of inoculation: as respects intertropical climates and the dark races, the candid inquirer into the merits of both will ere long, even if not now, declare for the latter. As inoculation is still practised in some countries, as it is still in many climates preferred to vaccination, and as it is the measure to which the majority of persons above forty years of age owe their protection from the natural distemper, the more important particulars connected with its performance require to be stated; and I cannot do this better than nearly in the words of Dr. GREGORY:

118. *Inoculated Small-pox.*—Inoculation is performed by introducing into the arm, at the insertion of the deltoid muscle, by means of a lancet, a minute portion of variolous matter. The thin lymph of a fifth-day vesicle is to be preferred to the well-concocted purulent matter of the eighth day, but both are efficient. One incision only is to be made. A minute orange-coloured spot is perceptible on the second day, by aid of the microscope; on the third or fourth day, a sensation of pricking is felt in the part. The punctured point is hard, and a minute vesicle, whose centre is depressed, may be observed, surmounting an inflamed base. On the fifth day, the vesicle is well developed, and the areola commences. On the sixth day, the patient feels stiffness in the axilla, with pain. The inoculated part has become a hard and inflamed phlegmon, the subjacent cellular tissue having become involved in the inflammatory action. On the evening of the seventh, or early on the eighth day, rigours, headache, a fit of syncope, vomiting, an offensive state of the breath, alternate heats and chills, languor, lassitude, or, in the child, a convulsive paroxysm, announce the setting in of fever. The constitution sympathizes with the progress of the local disorder, and the virus has affected the whole system.

119. On the appearance of febrile symptoms, the inflammation of the *inoculated part* of the arm spreads rapidly. An areola of irregular shape is soon completed, which displays within it minute confluent vesicles. On the tenth day, the arm is hard, tense, shining, and very red. The pustule discharges copiously, and ulceration has evidently penetrated the depth of the corion.

120. On the eighth day, spots of variolous *eruption* begin to show themselves in various, and often in the most distant parts of the body. In the majority of cases, the eruption is distinct and moderate. Two hundred vesicles are counted a full crop. Sometimes not more than two or three papulæ can be discovered, which perhaps shrivel and dry up, without going through the regular process of maturation. In other cases, the eruption is full and semi-confluent, passing through all the stages to maturation, and scabbing, and cicatrization, with as much perfection as the casual disease can display. Between these extremes every possible variety may be observed. The truly confluent eruption, with affection of the mucous surfaces, is very rare, and that implication of the fluids and of the nervous system, which together constitute the extreme of variolous malignity, is nearly, if not entirely, unknown. Secondary fever, therefore, is not common, at least in any intensity.

121. IX. TREATMENT.—Small-pox being a specific disease, of a determinate course as respects both the eruption and the febrile phenomena characterizing it, is less amenable to treatment than most other acute diseases. Nevertheless, rationally-devised means exert considerable influence on the course of the distemper. In many cases, little or no interference on the part of the physician may be required, but something is always expected from him when his aid is called in, and it should, therefore, be clearly known what measures may be injurious and what beneficial. In severe cases, however, medical aid is always more or less requisite and advantageous, but, to be the latter, it should be based upon sound pathological views, and upon an accurate recognition of existing morbid states. Dr. GREGORY justly remarks, that "it is a melancholy reflection, but too true, that for many hundred years the efforts of physicians were rather exerted to thwart nature, and to add to the malignancy of the disease, than to aid her in her efforts. Blisters, heating alexipharmics, large bleedings, opiates, ointments, masks and lotions to prevent pitting, were the great measures formerly pursued, not one of which can be recommended." We may smile at the red bed-hangings, the red blankets and counterpane, the mulberry wine, the juice of pomegranates, prescribed for the malady by JOHN OF GADDESDEN; "but if either he, or GORDONIUS, or GILBERTUS were to rise from their graves, and inquire whether this is one whit worse than mesmerism, or at all more absurd than homeopathy or hydropathy, we should, I fear, look a little foolish. Let us, then, avoid the errors of our ancestors, without reproaching them."

122. Even in more recent times, and down to the days of SYDENHAM, or even to those of VAN SWIETEN and HEBERDEN, physicians have entertained very erroneous notions as to the powers of medicine in small-pox, and as to the intentions by which they should be guided. They imagined that certain drugs possessed the power of promoting the eruption, and not only of promoting it, but of procuring a favourable sort—a power, however, which was much more frequently injurious than beneficial; and, as far as it was manifested, much

less rational and serviceable than the means employed for ages in the East in the treatment of small-pox. In this disease, we remark, as in several others, that the boasted powers of doctrinal science, when not fully advanced, are often more prejudicial than beneficial, especially when blindly adopted, and applied without the guidance of rational observation.

123. The treatment of small-pox should be directed with similar *intentions* to those recommended for the management of other fevers. Means should be employed, 1st, to moderate febrile phenomena, whenever they are severe or excessive; 2d, to prevent or remove local determinations or congestions of blood, or other concomitant affections or structural changes; and, 3d, to support the powers of life, whenever they are inordinately depressed or exhausted by the influence of the morbid poison on the nervous and circulating systems. These *indications* should never be overlooked in any form, stage, or state of the malady. In the mild or distinct form, the active adoption of them may not be required; yet even in it, the occasions which may demand their due observance should carefully be watched for, and promptly met when observed.

124. *A. The primary or initiatory fever* may not be recognised as that of small-pox in cases occurring independently of inoculation, or without obvious sources of infection, and in these the treatment of this stage must be conducted according to the principles developed under the treatment of continued fever (see *art.* Fever, § 126, *et seq.*). If, however, it be known, or strongly suspected, that the incipient disease is small-pox, the question arises, Shall there be any difference in the treatment to be adopted from that usually employed in continued fever? But, as it is in continued fever, so it is in small-pox, the febrile action, the type and character of the fever may vary from inflammatory to adynamic, or even putro-adynamic, and display in the latter, as I have shown in respect of the former, not merely either extreme of type, but every intermediate phase. The treatment of this period, therefore, must necessarily depend upon the states of the pulse and of the general phenomena, in connexion with existing evidence of vital power; and upon the acumen and capability of the physician in recognising with precision these various and varying states, and in controlling or guiding them to a successful issue. As remarked by Sydenham, the fate of the patient depends upon the treatment of this stage—that is, of the first three days of the disease.

125. The patient should be removed to a large and airy chamber, which ought to be darkened and well ventilated. He should be laid on a hair mattress, and be covered by a moderate quantity of bed-clothes, his head resting on a hair pillow, as being more cool than that in common use. The temperature of the room should be, according to the amount of febrile heat, from 55° to 65°, but preferably from 55° to 60°. If the disease be distinct, and the febrile symptoms not very severe, the patient may not be confined to bed during the day, his clothing being appropriate to the circumstances in which he is placed. A dose of calomel with James's powder, or antimonial powder, should be given, and be followed, three hours afterward, by a purgative pill or draught. After these, saline draughts in a state of effervescence may be prescribed from time to time, and the bowels preserved in a moderately open state by the usual cooling aperients. In the slighter forms of the disease, no farther medicine will be required; the beverages, diet, and regimen of the patient being regulated as stated hereafter.

126. If the primary fever assume a more severe and inflammatory character, and if the pain in the head, epigastrium, and loins, be too severe to be allayed by the above means, and more especially if the patient be robust or plethoric, blood should be taken from the arm in such quantity as the peculiarities of the case may warrant, in addition to these means. When the brain, lungs, or liver is congested, or the pulse full, hard, oppressed, or sharp, a moderate blood-letting, relatively to the state of the patient, ought to be prescribed; and this measure will be still more requisite when the headache is intense, the face flushed, and the vessels throbbing, the irritability of stomach extreme, the breathing oppressed, and the pulse full and labouring. When the eyes are suffused, and headache is experienced, leeches applied to the temples, or behind the ears, may be sufficient; or, in the more phlogistic cases, they may be employed in aid of bleeding from the arm, and be followed by calomel, James's powder, a purgative draught or pill, and cooling draughts. Dr. Gregory remarks, that "it has often been said that blood-letting, in the fever of invasion, interrupts the process of nature, repels the eruption, or so retards it, and so weakens the constitution, that the due concoction of the pustules is never effected. It is undeniable that a man may be bled unnecessarily and too largely in small-pox, but a moderate bleeding does no harm, and, if the fever runs high, often does great good." The propriety of having recourse to venesection, especially in the circumstances just mentioned, has been insisted on by Sydenham, Biendisant, Torrini, Dover, Berger, Stubbes, Falconet, and many others. De Valdes recommended blood-letting nearly a century before Sydenham; and Hecquet advised blood-letting from the feet at this stage. Hufeland very properly directed leeches to be applied to the temples when the disease was attended by convulsions. The quantity of blood to be drawn should depend upon the state of the pulse and other peculiarities of the case, always keeping in recollection the character of the prevailing epidemic and of physical influences.

127. *a. Emetics* have been advised by some writers on the invasion of the primary form of small-pox, and condemned by others. The propriety of having recourse to them depends upon the peculiarities of the case, the character of the epidemic, and the season in which the distemper occurs. Sydenham prescribed an emetic, after blood-letting, in the primary fever, and in the secondary fever with internal complication. He likewise had recourse to it as soon as the disease appeared to be confluent. But there appears to have been much vacillation in his opinions as to both emetics and blood-letting in small-pox at different epochs of his practice, or rather during the different epidemic prevalences of the malady, as shown by his brief accounts of several epidemics; and I cannot depend so firmly upon the opinions of a physician, as many are disposed to do, who did not perceive, or duly estimate, the contagious and infectious nature of the malady. That emetics are often of service, especially at the commencement of the primary fever, and when indications of biliary obstruction, congestion, or ac-

cumulations are present, and during autumn or summer, I cannot doubt; but it requires close observation and experience to determine with precision the exact circumstances and period of the malady requiring their exhibition. They have been recommended by Dedekind, Hecquet, Leake, and many others, but in a too empirical manner, and with little regard to either the peculiarities of the case, the stage of the malady, or the choice of the agent. A writer in the Berlin Medical Transactions advises repeated emetics in this disease. The effects of one, however, will show the propriety of having recourse to it, and likewise of repeating it. In the low, adynamic, or confluent states of the disease, more especially, the choice of the agent is of some importance; for in these states the more nauseating or depressing emetics, as tartar emetic or ipecacuanha, are not so appropriate as in the sthenic forms of the malady, unless they be conjoined with stimulants, aromatics, &c. In the former states the sulphate of zinc should be preferred. Some writers suppose that emetics diminish, others that they increase, the quantity of eruption; but it may be said of emetics, as of blood-letting, that they have little or no effect upon the eruption, or in lessening confluence. Their influence is exerted chiefly in promoting the excreting functions, while blood-letting diminishes inordinate vascular action, and relieves internal oppression and congestion.

128. *b. Purgatives* are generally beneficial during the primary fever, and very often also in the secondary fever; but they are required more especially when the secretions and excretions have not been duly evacuated previously to treatment, when the indications of local determinations, particularly to the head, are manifest, and when sthenic febrile excitement is considerable. In these circumstances not only purgatives, but the whole of the *antiphlogistic regimen*, as insisted on by Sydenham, Hoffmann, Van Swieten, Bartholinus, Dimsdale, Currie, Eyerel, Beddoes, Perkins, &c., are beneficial. Much, however, depends upon the selection and combination of these means appropriately to the peculiarities of the case. In the primary fever, *calomel* is generally most serviceable, especially when conjoined with antimonials in the more sthenic forms of the disease, and with camphor in the more asthenic; but in most cases a full dose of the calomel should be followed by a purgative draught in a few hours if it have not operated sufficiently. Dr. Fowler supposed that when calomel was given early in the eruptive fever it diminished the quantity of eruption. But it cannot have this effect unless it be taken before the first indications of eruption exist, and then its influence must be necessarily doubtful.

129. Osiander very justly cautions against too much purging; for it may develop an intestinal complication in the form of either diarrhœa or dysentery, and thereby greatly endanger the patient. In the more inflammatory or sthenic cases the phosphate of soda, the citrate of magnesia, or other cooling saline purgatives, should be preferred, or such as may be compatible with the use of saline diaphoretics, as the liquor ammoniæ acetatis and spiritus ætheris nitrici; but in asthenic or confluent states of the disease, after a dose of calomel or camphor, I have preferred to give the spiritus terebinthinæ, with about an equal part of castor oil, on the surface of a suitable vehicle, in quantity sufficient to act moderately on the bowels. If this dose be rejected, the effect will, notwithstanding, be more or less beneficial, and after some hours it should be repeated, or the same substances in larger doses should be administered in an enema, which may be repeated according to circumstances.

130. During the primary fever pain at the epigastrium is often considerable, or even urgent, and is frequently accompanied with irritability of stomach, and the rejection of whatever is swallowed. It may be requisite, from the severity of these symptoms, to endeavour to abate them. This object will be most readily attained by giving a full dose of calomel with a moderate dose of camphor and opium, and a little cinnamon or ginger in the form of bolus, or in that of powder mixed in a little treacle. In these circumstances, saline effervescing draughts, with or without tincture of opium, generally fail of giving relief. If the disease presenting these symptoms is of an asthenic or confluent kind, as commonly observed, or if the medicine now recommended is not sufficiently efficacious, a mustard poultice may be applied over the epigastrium, or a mustard pediluvium or semicupium may be employed. In most cases I have preferred to the mustard poultice the application over the epigastrium of equal parts of the compound camphor liniment and of the turpentine liniment, with a little cajuput oil, and sometimes with a little olive or almond oil, on the surface of flannel or spongio-piline.

131. *c. Cooling diaphoretics*, especially small or moderate doses of the solution of the acetate of ammonia, or of the citrate of ammonia, or of the citrate of magnesia, or of the citrate of soda or potass, with the spirit of nitric ether, according to the states of the surface and of the bowels, will generally be of service, and the acid may be somewhat in excess when vascular action is inordinate. Cold sponging the surface during the early part of the primary fever, or even the cold affusion, may be resorted to, as advised by Bartholin, Currie, Beddoes, Jackson, and others; but when the eruption appears these should be relinquished, for I believe that the recommendation of Schaeffer, Swainson, Hufeland, Watson, and Selle not to employ these means at this period is altogether judicious. Marcard considered, and with much reason, that the tepid bath, previously to the appearance of the eruption, moderated the primary fever; and he recommended warm stimulating baths in the low and retrocedent states of the distemper. Many of the writers already named cautioned against carrying the cooling regimen too far, or employing excessive cold, in the treatment of low, confluent, or epidemic states of the disease, justly contending that a moderately cool or fresh state of the air, and a judicious recourse to restoratives or tonics were altogether indispensable in many cases, and especially in the epidemic prevalences of the malady. The treatment which appears the most appropriate to these cases will be hereafter stated (§ 143, *et seq.*).

132. Dr. Gregory justly remarks, that "if the circulation at this period (the primary fever) be languid—if the pulse be small and feeble, the skin pale, and the extremities cold—if the patient lies on his back, sunk and exhausted, let him have immediately warm brandy and water, cover him with bed-clothes, apply mustard poultices to the centre and extremities of the circulating system, and give thirty drops of laudanum,

to be repeated in four hours if necessary. This cordial plan of treatment must often be continued for several days, when the eruptive nisus is accompanied with depression, and nature appears so obviously unequal to the effort."—*Op. cit.*, p. 100. In these circumstances the opium should be given with camphor, or ammonia, or both; and the hot terebinthinate epithem will generally be more efficacious than the mustard poultices.

133. *B.* During the progress of the eruption, and in the *remission of the fever* which produced it, but little beyond a suitable regimen is required. A too officious recourse to medicine is oftener prejudicial than the contrary. The same remark applies to the secondary fever, or suppurative stage, when the disease is discrete and there is no complication. During the period of eruption and development, however, the secretions and excretions should be carefully watched and cautiously promoted, without producing irritation; and the senses and mind ought to be guarded against excitement, very light and bland beverages, and mild, weak, farinaceous nourishment, in small quantity only, being allowed. Dr. GREGORY's remarks as to the treatment of this stage are so judicious, that I shall adduce them at this place.

134. "While the pustules are in process of maturation a variety of measures may be pursued, which, without interrupting the salutary and necessary process of pustulation, lessen the patient's sufferings, and prevent subsequent difficulties. If the eruption proceeds favourably you would not do more than lessen thirst by saline draughts, and occasionally relieve the bowels by a dose of castor oil. If the maturation of a large crop of pustules excites much fever, it will be prudent to employ more active purgatives, such as calomel with colocynth, the compound powder of jalap, or the infusion of senna with salts, all which cause a drain from the blood-vessels and lower arterial action. Place the patient in a large and cool room, and cover him lightly with bed-clothes. Remove all flannel coverings which may usually be worn next the skin. If the surface be very tender, apply to it some cooling lotion, such as the decoction of bran with some spirit of rosemary. In all cases, even of moderate intensity, it is proper to cut the hair close, and so to maintain it during the whole course of the disease. The head is thus kept cool, delirium is relieved or prevented, the risk of cellular inflammation of the scalp diminished, cleanliness enforced, and an opportunity afforded for the employment of evaporating lotions, should more urgent symptoms arise. Opiates may be occasionally administered at bed-time, when there is much cuticular irritation, or great distress from want of sleep.

135. "The diet of the patient should consist of tea, bread and milk, arrowroot, rice-milk, and roasted apples. Grapes, oranges, and ripe subacid fruits are grateful to the patient, and useful adjuvants to the antiphlogistic remedies. Lemonade, apple-water, tamarind-water, toast-water, and milk-and-water must be the ordinary beverages. SYDENHAM permitted his patients to drink small-beer—an indulgence which may still be granted. To that able physician we are indebted for this, the cooling system of treatment in small-pox.

136. "One of the first objects which, in cases of more urgency, will attract your attention, is the condition of the throat. Gargles of infusum rosæ comp. afford some relief. When the difficulty of swallowing is very great, and the tonsils much swollen, leeches applied to the throat, followed by poppy-water fomentations, are serviceable. Under these circumstances, some physicians counsel you to apply to the throat, by means of a camel-hair pencil, a strong solution of lunar caustic (twelve grains to the ounce), with the view of checking the advance of the mucous vesicles. I have not adopted this practice, from a conviction that it would not affect the tracheal inflammation, from which alone danger is to be apprehended."—(*Op. cit.*, p. 101.) More recently, much stronger solutions of nitrate of silver—from forty to sixty grains to an ounce of distilled water—have been applied to the pharynx, inside of the glottis, and even within the larynx and upper part of the trachea, by means of a sponge attached to whalebone, and, it is said, with success in some cases. Chlorinated lotions and gargles are generally of use when the affection of the throat and nasal passages is severe in confluent small-pox.

137. *C.* During the *secondary fever*, when it is severe or complicated, the treatment should be active but discriminating. The use of *purgatives* at this period was once a question of warm discussion. Dr. GREGORY remarks as follows: "One of the most remarkable disputes which ever arose in physic was that regarding the propriety of using purgatives during the secondary fever of small-pox. SYDENHAM, with all his boldness, never wholly divested himself of the early prejudices which the Arabians had inculcated against purgatives in small-pox. MORTON inveighed bitterly against their use, while Dr. FRIEND, with the true spirit of a reformer, advocated their free employment, especially during the secondary fever." "They are now as freely employed in the secondary fever of small-pox as in ague or in typhus. They are of the greatest service when the skin is hot and dry, when a scarlatinal rash covers the body, or innumerable abscesses give evidence of the excited state of the cutaneous vessels."

138. Agreeing with the foregoing remarks, I would add only that when too strong or too frequently exhibited, purgatives may induce a dangerous diarrhœa or dysentery, or an enteric complication, especially if the selection of the means be not sufficiently discriminating in respect of the peculiarities of the case. As long as the disease manifests but little exhaustion of vital power this care may be of less importance; but when vascular action is asthenic, and constitutional power is depressed, then such aperients as promote excretion, and, at the same time, impart tone or energy, should be preferred. Such are the means advised above (§ 128, 129), and such, also, are the compound decoction of aloes, or the compound infusions of gentian and senna, given in conjunction with the carbonates of the alkalies and aromatic tinctures, or with the citrate of magnesia, or with the carbonate or citrate of ammonia. In many cases it may be requisite to aid the operation of these by means of enemata containing the substances already mentioned, with such others as the exigencies of the case will suggest.

139. The propriety of *blood-letting* in the secondary fever has been denied by most writers, and contended for by others, but by these latter

under certain circumstances only. Sydenham, when he first wrote on small-pox, advised blood-letting in the secondary fever of the confluent disease alternately with purging; but at later periods of his practice, and when describing the epidemics of 1670 and subsequent years, which were manifestly of a most malignant character, the treatment recommended by him was of a very different kind (§ 147, 149) from that formerly directed. It would seem that the small-pox previously to 1665 and 1666, that is, before the great plague, was of a more sthenic nature than subsequently, and that after this most fatal epidemic, by which about 100,000 bodies were buried in a few months within and immediately around London, thus furnishing additional sources of contamination to both air and water for many years afterward, small-pox and other febrile diseases presented a more malignant character, and required different means of cure from those formerly employed.

140. When the pulse presents more or less tone, and vascular action is high, in connexion with internal complication—congestive or inflammatory—then blood-letting, cautiously and moderately employed, according to the peculiarities of the case, and aided by such means as may derive the fluids from the seat of complication, and promote excretion, &c., will prove of much service. But if the pulse be weak, very quick, compressible, or small and soft, and more especially if there appear any signs of putro-adynamia or malignancy as respects either the state of the eruption or the constitutional symptoms, decided means of an opposite kind are obviously indicated (§ 143, *et seq.*).

141. In the secondary fever, when uncomplicated with any *internal affection* or *contamination* of the circulating fluids, little beyond the preservation of a free state of the secretions and excretions need be attempted, aided, however, by a suitable regimen. In cases presenting prominent affection either of the brain or its membranes, or of the lungs, pleura, &c., general or local blood-letting, or both, according to the peculiarities of each case, is generally requisite, and purgatives and derivatives are farther required. The state of the surface may appear to contra-indicate a recourse to blisters, but when the pustules on the trunk, or in the situation where it is desirable to apply a blister, are few, then they may be applied; and in these circumstances, as well as in others in which they should not be resorted to, the terebinthinate embrocations or epithems, often recommended in this work, may be employed without regard to the state of pustulation in the situation to which it may be desirable to make these applications. The treatment recommended in the complications of continued fevers (*see art.* Fever, § 529, *et seq.*) is generally suitable to those which occur in the course of small-pox, existing pathological states furnishing the only true therapeutical indications in all forms of fever, whether simply continued, or exanthematous, or malignant.

142. Ophthalmia is one of the most common of the concomitant affections in small-pox. In many cases of this complication, the state of the system will not admit of general or copious blood-letting; but in these, as well as in most other severe cases, scarification of the conjunctiva, leeches or cupping-glasses on the temples, warm fomentations, calomel, purgatives, terebinthinate medicines given by the mouth and in enemata, are required, and should be mainly depended on, in connexion with such other internal, constitutional, or febrifuge means as the character and state of the febrile symptoms will suggest.

143. *D. In the confluent states of variola*, or even when the pustulation is profuse and general, the treatment should be such, from the commencement, as will not reduce the powers of life; and even before the eruption appears, and when the character of the primary fever, and the severity of the vomiting and pain in the back and loins, and the stinging heat of the surface, indicate a severe or confluent form of the disease, it may be necessary, especially if the pulse be very rapid, or deficient in tone, or broad, open, and very compressible, to have recourse to the more tonic of the several febrifuge medicines usually employed. In these cases, as well as in others presenting signs of putro-adynamia, as petechiæ, hæmorrhage from mucous canals, a dark brown or black appearance of the eruption, whether at an early stage, or during the maturation and secondary fever, the preparations of *cinchona*, either with the mineral acids or with the alkalies, according to the features of individual cases, are generally required.

144. Cinchona was prescribed in these states of the disease in various forms of preparation and combination, and was administered in enemata by Gesner, Fouquet, Bayley, Hirzel, Wall, Baldinger, and others; and they relied upon it chiefly in the secondary fever, when accompanied with sinking of the powers of life, or with putro-adynamia. Hufeland advised the preparations of cinchona to be given with antimonial wine; but this combination is admissible only at an early stage of confluent or malignant cases, and is not suited to the more advanced stages, or when hæmorrhagic exudations are observed. In these latter circumstances, I have found the decoction of bark to be most beneficial when conjoined with the hydrochloric acid and the hydrochloric ether, or with the chlorate or the nitrate of potash and tincture of serpentaria, or with the nitric acid and spirit of nitric ether. The sulphuric acid was advised, in the form and states of the disease now being considered, by Sydenham, Brocklesby, Waldschmidt, Nowach, and others, conjoined with various stimulants. More recent writers have conjoined the decoction or infusion of cinchona with the sulphuric acid, and the spirits of sulphuric ether, for these and similar states of the distemper; and still more recent authors have employed the sulphate of quina in these or similar forms of combination. These means are severally of more or less service; and it may be even necessary to combine them still farther, as with the tincture of opium, or with the compound tincture of camphor.

145. The nitric acid was recommended by Dr. Scott for the more adynamic and confluent states of the malady; the hydrochloric acid by Jahn, and the acetic acid with camphor by Marx, Thomann, Plinta, and Hopf. Either of these acids, or of those above mentioned (§ 143, 144), or the citric acid, is more or less beneficial when suitably conjoined with tonics, cordials, or stimulants, according to the peculiarities of the case; and in these combinations they have been prescribed by Falconet, Rush, Thuessinck, Lafontaine, and others. Of the good effects of the acetic or the citric acid, conjoined with camphor,

or with ammonia, this latter being in excess, and given with the infusion or decoction of cinchona, and aided, in the more severe cases, by wine, beef-tea, &c., I can speak from experience.

146. *E.* In the *petechial form* of small-pox treatment will generally prove inefficacious. Dr. Gregory thinks that it admits of no essential relief from medicine. He considers purgatives to be inadmissible, and mercury without influence. The loss of a little blood from the arm has appeared to him more effectual than any other measure. "The citrate of ammonia in effervescence, with port-wine or brandy, may be given when the powers of life appear to fail, but the hæmorrhagic diathesis is often accompanied by a hot skin and an excited circulation."—(*Op. cit.*, p. 104.) When the skin is hot and the circulation excited, in connexion with petechiæ, or spots of purpura, or with hæmorrhage from mucous canals, the abstraction of a little blood from the arm may prove beneficial; but these symptoms should not prevent a recourse to the means just recommended (§ 143, *et seq.*); for they often subside after a decided recourse to these means, especially when the medicines are directed to the prevention or counteraction of the contamination of the blood, and the defect of vital power, upon which they depend. When the prostration is not great, nor the hæmorrhage very considerable, nor the eruption of a dark or malignant hue, then recovery may follow a recourse to cinchona, conjoined with the chlorate or nitrate of potash, and with the carbonate of soda and cordial or stimulant tinctures; camphor, or small doses of turpentine, being given occasionally in the intervals between the exhibition of these. Instead of cinchona, the preparations of valerian may be employed. I have generally preferred them when delirium was present. If the bowels are affected, the preparations of opium, or the compound tincture of camphor, should be added to these; and if the evacuations are very offensive, as well as too frequent, pure charcoal-powder, or the chlorides in small but frequent doses, may be prescribed. When, with these putro-adynamic symptoms, the liver is inactive or congested, then the nitro-hydrochloric acids may be prescribed in the decoction or infusion of cinchona, or the infusion of valerian; and when cerebral symptoms predominate, or when low delirium, tremour, and nervous exhaustion prevail, then the tincture of *sumbul*, lately introduced into practice by Mr. Savory, will be found of great service.

147. In cases presenting more or less contamination of the circulation and adynamia, as those now considered usually present, small and repeated doses of *opium*, especially when conjoined with camphor, or the chlorides, or the nitro-hydrochloric acids, or with cinchona, or valerian, or sumbul, will generally be most serviceable. When the bowels are most relaxed, in such cases the preparations of opium are more especially required; and they may be given with milk and lime-water, or with aërated lime-water. In the circumstances just named, and more especially in the secondary fever attended by marked putro-adynamia or malignancy, Wandt and Stroem prescribed opium with the sulphate of alumina. Dr. Drummond recommended the preparations of opium, in large doses, from the commencement of the eruption in confluent cases; Tralles, Gebel, and Young adopted a similar treatment. P. Frank considered these preparations to be deserving of our chief reliance in these cases, and the same opinion was entertained by Huxham, De Haen, Hufeland, Sprengel, Stoerck, and others. Sydenham considered them of greatest service when exhibited on the fourth day of the eruption in adults, and given in the evening or towards night. He trusted to them especially in the confluent form, and about the eleventh day, or most dangerous period of the disease. Thomann prescribed opiates in severe cases, after the exhibition of an emetic; and Quentin combined them with the oxide of zinc. The preparations of opium, with the exception of the weak paregoric of the pharmacopœia, cannot be given, without the risk of producing severe cerebral symptoms, in children under the age of four or five years; and even at that age, these symptoms may occur, if they be not guarded against by resorting to cold-sponging over the scalp, and by cooling aperients. In cases which most require opium, camphor, or ammonia, or the usual aromatics or stimulants, are also beneficial, and both promote the good effects, and counteract the injurious influence, of this substance. The excellent effects of the laudanum prescribed by Sydenham depended upon the combination of aromatics in its preparation—a combination which has been very imperfectly estimated, even by his warmest admirers.

148. *F.* The *laryngeal and tracheal affection*, arising in the course of severe variola, is generally an extension of the specific inflammation existing in the mouth and throat, and is seldom much ameliorated by the means already noticed (§ 143–147). After having had recourse to these, emetics, especially the sulphate of zinc, or ipecacuanha conjoined with camphor, or ammonia, or capsicum, may be tried; for these have a more decided effect upon the respiratory surfaces than is generally recognised, especially in removing the viscid mucus from the trachea and large bronchi that generally collects in large quantity in these situations when the severe forms of small-pox are thus complicated. In these complications, the decoction of senega, or the preparations of squill, or of ammoniacum, conjoined with camphor or ammonia, or other substances which the circumstances of the case will suggest, may be prescribed; and if these expectorants should act as emetics, as they will generally act when given in large doses, the effect will be the more beneficial, especially in confluent, or severe, or malignant cases.

149. *G.* The occurrence of *diarrhœa* or of *dysenteric symptoms*, especially in connexion with the secondary fever and in confluent cases, requires means which should partly depend upon the appearance of the evacuations. In most cases, the medicines already mentioned (§ 146, *et seq.*), ipecacuanha with camphor and opium, or with powdered carbon and the compound chalk-powder; and the other medicines usually given for diarrhœa or dysentery, may be severally prescribed in these complications of small-pox. Sydenham gave boiled milk with lime-water in these cases, or with ammonia or magnesia when the stools evinced a somewhat sourish odour; and Royer and many others adopted a similar practice. But when this complication appears in malignant, or even in the more usual confluent cases, more active astringents are required, and these should be associated with antiseptics, and absorbents, and opiates.

150. *H.* The state of the *urinary secretion* should receive due attention from an early period of the disease. The urine is often not only small in quantity, but also voided at long intervals in some instances; and it is occasionally remarkably high-coloured, and even contains albumen, and not infrequently blood, especially in the confluent and malignant cases. In the early stages of the more phlogistic cases, especially when the urine is scanty and very high-coloured, demulcents and diluents should be freely given, with the cooling diaphoretics already mentioned (§ 131), and with diuretics of a cooling and febrifuge kind, as recommended by THOMANN, LENTIN, and others. When the urine contains albumen, or blood globules, or even pure blood, then the terebinthinate embrocation or epithem may be applied over the loins, and repeated according to its effects.

151. *I. Small-pox in puerperal females*, especially when it occurs very soon after delivery, is always a most dangerous disease. Not only is it generally confluent, and attended by marked asthenia, but it is also complicated with very severe, and usually fatal, affection of the respiratory mucous surface, extending to both lungs. Of several cases of variola to which I have been called in the puerperal state, I have seen only one which was mild and uncomplicated. The treatment in these unfavourable circumstances should partly depend upon the time which has elapsed between delivery and the appearance of the distemper, partly upon the amount of hæmorrhage which has taken place at the period of delivery or subsequently, and upon the states of the lochia and of the lacteal secretion. When the discharges have been and are free, and the pulse is very frequent and soft, the severity of the laryngeal, bronchial, or pulmonary complication, or indeed of any other associated affection, should not prevent recourse to the means already recommended for the severe, confluent, and adynamic states of the malady (§ 143, *et seq.*), especially to camphor, ammonia, wine, or other stimulants and tonics; or to such as are advised for the malignant form of *puerperal fever* (see that article). When the respiratory passages are very severely implicated, the remedies already mentioned, especially senega, squills, ammoniacum, sulphate of zinc, &c., prescribed as expectorants or as emetics, according to the emergency of the case, ought not then to be overlooked. The great severity and unfavourable prognosis of small-pox in the puerperal state should not prevent a decided recourse to the most active means in the treatment of this class of cases, but, on the contrary, should induce us to employ the most energetic medicines in the most prompt and appropriate manner.

152. ii. EXTERNAL MEANS HAVE BEEN USED TO GIVE RELIEF AND PREVENT PITTING, but they do not always succeed as respects the former intention, and they often fail as regards the latter. When pustulation is profuse, Dr. GREGORY advises the surface to be liberally covered with some simple dry powder. Starch-powder, hair-powder, and powdered calamine are alike available for this purpose; cold cream, and mild unguents, such as the unguent. cetacei, with a proportion of oxide of bismuth, are useful when there is much cutaneous irritation with a dry surface. "Fomentations and poultices are the only means of treating those abscesses and erythematous inflammations which so harass the patient, and so fearfully peril life in the later periods of secondary fever. All the attempts made by the use of masks to prevent pitting end in disappointment. The only effectual means of lessening such disfigurement are those which allay cutaneous action. Purgative medicines, low diet, and free exposure of the face to a cool air, are the sole measures on which reliance should be placed." —(*Op. cit.*, p. 108.)

153. While these means ought to be adopted, others may also be tried. Fresh air should be duly admitted; but, at the same time, light ought to be excluded as completely as possible. I believe, from what I have observed in several cases, that complete darkness prevents pitting, and that light increases the suppurative action in the pustules, and thereby occasions deep and permanent marks. While the patient should breathe a freely-renewed air, the vesicles should be protected from the action which the oxygen of the air exerts upon them; and this may be done by various means, either by causing the vesicles to discharge their contents before suppuration commences, and by favouring the drying of their contents upon their surfaces, the scabs thus forming a natural protection from the action of the air, or by covering the vesicles with some substance which may lessen the suppurative process, by protecting them from the air, and by lowering inflammatory action in the cutaneous surface.

154. The Arabians opened the pustules as fast as they ripened by a gold needle; and the moderns have applied lunar caustic to the pustules, so as to destroy them at an early period of their development. As to this latter practice, Dr. GREGORY remarks that, as a partial application—say to vesicles forming near the eye—he can recommend this measure; but that he cannot advise it to be employed to any large surface covered with confluent or semi-confluent vesicles. He adds, "The latest mode of treating the surface during the maturative stage of small-pox is that of applying mercurial plasters, containing calomel, or corrosive muriate of mercury, or covering the whole surface with mercurial ointment. In the French hospitals, at the present time, the latter mode is in fashion. The reports of its success are not, however, very flattering. I have seen all three plans fairly tried at the Small-pox Hospital. The ointment and calomel plasters were inefficient. The plaster of corrosive sublimate converted a mass of confluent vesicles into one painful and extensive blister; but I am still to learn what benefit the patient derived from the change."—(*Op. cit.*, p. 103.)

155. Other means have been used for the prevention of pitting, either by causing the abortion of the pustules in the course of their development, or by drying them up after they have maturated. Dr. BULKLEY remarks, that, as a general rule, the more recent the eruption, the more easily it is arrested. One writer thinks that the pustules can be arrested, even after their suppuration, and another fixes the period at which this can be done as late as the seventh day. In 1825, I tried the effect of complete exclusion of light in preventing pitting, and in that case it was altogether successful. I have since had recourse to it in three or four cases with success; in one confluent case it failed. I have, in three other cases, covered the surface of the face with almond or olive oil, and excluded light, keeping the apartment freely ventilated; these have not been

marked; the eruption was very copious, but not confluent in any of these. Instead of almond or olive oil, glycerine, or collodion, as suggested by Dr. RANKING, may be employed.

156. Incising or opening the pustules, or rather the vesicles, as recommended by the Arabians, was the method of causing their abortion advised by ROGGERT, VOIGT, TOURNAY, and HUFELAND. M. VELPEAU and Dr. MORTON assert, that if the pustules are cauterized within two or three days, or even later, no marks will be left. The latter says, that if the face be frequently wetted with spirits of hartshorn, the inflammation will be abated, and the pustules will be prevented from becoming either large or irritable. M. PIORRY recommends blisters to cause abortion of the pustules, but I consider their use not required in discrete cases, and of very equivocal benefit in the more severe states of the distemper. M. MALAPERT prescribes a solution of hydrate of potassa, which, he says, dries up the pustules, without leaving either cicatrices or stains. The strength of the solution is not stated.

157. Many years ago, DIGBY directed the face to be covered with *gold-leaf*. LARREY advised the same means, and stated that this method of preventing pitting by small-pox was employed from time immemorial by the Egyptians and Arabians. It can act only by excluding light and air from the diseased surface. Drs. CRAWFORD and S. JACKSON, of the United States, say that they have found the *tincture of iodine* to succeed in preventing the marks of variolous pustules; and various kinds of ointment and plaster have been also confidently recommended with this intention.

158. *Sulphuric ointment*, rubbed lightly three times a day over the parts affected, has been recommended for the prevention of suppuration in the pustules and the consequent pitting (*Gaz. Méd. de Paris*, Avril, 1841, p. 232). The emplastrum plumbi, melted with oil of almonds, and laid over the face by a camel's-hair pencil, has been prescribed by Dr. CORRIGAN (*Dublin Quarterly Journ. of Med. Science*, Aug., 1846, p. 245). A mask, composed of mercurial *ointment*, rendered more consistent by means of starch or fecula, is employed by M. BRIQUET. He causes it to be spread over the face, and to be renewed once or twice daily. He says that it produces abortion of the pustules, and prevents the swelling attending the confluent form of variola. The same means have been recommended by Prof. BENNETT, of Edinburgh (*Edinb. Monthly Journal of Med. Science*, Jan., 1850).

159. A compound mercurial *plaster*, called the "plaster of Vigo," is often employed for the prevention of pitting by French physicians. According to M. BRIQUET, if mercurial plaster be applied before the fifth day of the eruption, one of two things happens—either the pustules disappear by resolution, or they are changed into vesicles or into tubercles. The latter change is more rare, and seldom takes place except on the face. When the dressing is removed, small, hard excrescences, insensible to the touch, are seen, which gradually fade, and disappear at the end of ten or twelve days, partly by resolution and partly by desquamation, and without leaving any trace. The mercurial plaster must be kept on from eight to twelve days (*Gaz. Méd. de Paris*, Avril, 1846).

160. A solution of corrosive sublimate—one grain to seven ounces of distilled water, and a drachm of laudanum—applied by compresses kept wet with it, is also said by Dr. BULKLEY to produce very marked effects in causing the disappearance of pustules, even after they have fully matured; and he adds that simple mercurial ointment is much more frequently used, both in Europe and in America, than either the plasters of Vigo or the wash of the bichloride, and is probably equally efficacious. It may be applied freely with a brush or a camel's-hair pencil. Dr. STEWARDSON, of Philadelphia, speaks very favourably of its effects (*Amer. Journ. of Med. Science*, June, 1843. *See also* Dr. BULKLEY's *Notes to* Dr. GREGORY's *Lect. on Erupt. Fevers*. New York, ed. 1851, p. 351).*

161. iii. INOCULATED SMALL-POX should be treated according to the principles already insisted on, and with strict reference to the type or character of the primary fever, and other features of individual cases. The SUTTONS and DIMSDALES, whose reputation for successful inoculation became so remarkable about the middle of the last century and somewhat later, insisted upon exposure of the surface of the body to cold air during the primary fever, and upon the full adoption of the antiphlogistic regimen.

162. It was recommended by many physicians who practised inoculation before the introduction of vaccination, to *prepare* the patient by treatment shortly before and after the operation, or until the primary fever appeared. Others considered any preparation unnecessary, and sometimes even prejudicial. Several eminent writers, such as THOMANN, HUFELAND, and others, advocated the propriety of correcting the secretions and excretions, and of promoting a free state of the several emunctories, especially when these appeared to require this aid, by one or more doses of calomel and antimony. FORDYCE, however, considered this practice to be unnecessary, and EYEREL, BOEHMER, and others, contended that there is no mode of preparation of any use. GMELIN recommended abstinence from animal food for some time previously to inoculation, but WEIKARD believed even this plan to be injurious. On this topic Dr. GREGORY very judiciously remarks, "Perfect health being the best condition for receiving and safely eliminating the poison, every thing that tends to diminish plethora, to lessen cutaneous action, to render the bowels free, to preserve the blood in a cool, pure, and normal condition, was found useful. Laxative medicines, a moderate diet, abstinence from all fermented and spirituous liquors, cool chambers, gentle exercise in the open air, light clothing, all contributed, in their several degrees, to the successful result. The antimonial and mercurial medicines, which the SUTTONS laid much stress

* [It has been proved very conclusively that the application of a mercurial plaster has a decided influence upon the small-pox pustules, preventing more or less completely their perfect maturation, and diminishing the attendant swelling and soreness, the process of desiccation being completed without the formation of thick scabs, and the resulting cicatrices less marked than when the process of suppuration was left to pursue its natural course; and this is chiefly observable in cases where the eruption has not advanced beyond the third or fourth day. The same result can, however, be still more effectually attained by the use of collodion. This, however, is no new practice. Dr. DOUGLASS, in his "Treatise on Small-pox" (Boston, 1730), speaks of the use of a mask made of lead, beat thin, the inside smeared with spermaceti and a small quantity of crude *mercury*, as very successful in preventing pitting and scars.]

upon, were useful only to secure the co-operation of the patient in matters of more necessity, especially diet and exposure to the open air."—(*Op. cit.*, p. 110.)

[The small-pox has been a most fatal scourge to the aborigines of this continent. The disease has appeared among them periodically, from the first discovery of the continent, at irregular intervals of time, and has been one of the most prominent causes of their depopulation. This malady swept through the Missouri Valley in 1837. It first appeared on a steam-boat (the St. Peter), in the case of a mulatto man, at the Black Snake Hills, a trading fort 60 miles above Fort Leavenworth, and about 500 miles above St. Louis. It was then supposed to be *measles*, but by the time the boat reached the Council Bluffs it was ascertained to be small-pox, and had, of course, been communicated to many in whom the disease was still latent. In spite of every precaution, the disease spread. It broke out among the *Mandans* about the 15th of July. This tribe, which consisted of 1600 persons, living in two villages, was reduced to 31 souls. It next attacked the *Minnatarees*, who were living in that vicinity, and reduced that tribe from 1000 to about 500. The *Arickarees*, numbering 3000 souls, were diminished to some 1500. The disease spread from these to the *Assiniboins*, a powerful tribe of 9000, living north of the Missouri, and ranging in the plains below the Rocky Mountains, towards Red River of Hudson Bay; whole villages of whom it nearly annihilated. The *Crows*, or *Upsarokas*, who were estimated at 3000 strong, shared nearly the same fate, and lost one third of their numbers. It then entered and spent its virulence upon the great nation of the *Blackfeet*, who have been estimated at from 30,000 to 50,000. The inmates of 1000 lodges were destroyed, numbering from six to eight persons in each lodge. So that at the lowest calculation over 10,000 Indians fell victims to this disease in a few weeks.

An eye-witness thus describes the scene: "Many of the handsome Arickarees, who had recovered, seeing the disfiguration of their features, committed suicide, some by throwing themselves from rocks, others by stabbing and shooting. The prairie has become a grave-yard; its wild flowers bloom over the sepulchres of Indians. The atmosphere for miles is poisoned by the stench of the hundreds of carcasses unburied. The women and children are wandering in groups, without food, or howling over the dead. The men are flying in every direction. The proud, warlike, and noble-looking Blackfeet are no more. Their deserted lodgings are seen on every hill; no sound but the raven's croak or the wolf's howl breaks the solemn stillness. The scene of desolation is appalling, beyond the power of the imagination to conceive."—(*Hist. and Statist. Information, &c., respecting the Indian Tribes of the U. States*, by H. R. Schoolcraft, LL.D., part i., 1852.)

The early history of America also contains some accounts of the ravages of small-pox among the Indians; they are but mere fragments, but are sufficient to show its frightful mortality. It prevailed among the Iroquois with great severity in 1663, as related by Charlevoix. He does not give the number destroyed in this pestilence; but in a subsequent one, in 1670, near Trois Rivières, he states that 1500 were attacked, and not one recovered.—(*Hist. et Descrip. Gen. de la Nouvelle France*, vol. i., p. 378; vol. ii., p. 428.)

Small-pox in New York, in the year 1815, says Dr. James Stewart (*Diseases of Children*), was so virulent as to attack almost every individual in whom the susceptibility had not been destroyed by vaccination. The proportion of deaths from the confluent kind, in the opinion of the committee of the Medical Society appointed for the purpose of inquiring into the efficacy of vaccination, was greater than was ever observed in London or on the Continent of Europe. Of 254 deaths from small-pox, recorded in the city inspector's register, somewhat more than one third were of the confluent kind. With such facts of the virulence of the disease, what would have been the condition of the city had the ravages of the disease not been controlled! Judging from what has heretofore occurred, every dwelling would have been literally a loathsome hospital, and every surviving inhabitant a terror-stricken mourner. The number of deaths in the city of New York from small-pox, from 1805 to 1853 (inclusive), is 5645, as reported; but the number must have been considerably larger, inasmuch as those removed to the country for interment are often not reported.

The following calculation exhibits the proportion of deaths in the city of New York in every 1000, from the year 1805, when the reports were first made, to the end of the year 1840: During the first period of five years, the number was 26 in 1000; in the second period, 14; in the third, 23; in the fourth, about 25; in the fifth, 18; in the sixth, 21; and in the seventh, at the close of 1840, 21. From the year 1800 to 1841, 1068 small-pox patients have been treated in the Marine Hospital at Staten Island, nearly all of whom were passengers from foreign ports; the exact mortality we are unable to state. It is somewhat remarkable that the mortality from small-pox has not been greater in New York than it has, considering that the number of emigrants has greatly increased within a few years, among whom the disease prevails with great severity. Vaccination being universally adopted by the permanent inhabitants of the city, they are by no means the class among whom the disease prevails; but it spends its violence among the transient emigrant population, where vaccination has been comparatively neglected.—(J. Stewart.)

We are chiefly indebted to Lemuel Shattuck, Esq., for the following facts: The small-pox prevailed in Boston in 1649, 1666, 1678, and 1690. It proved very fatal in 1678. Mather said, in 1698, "The small-pox has four times been a great plague upon us. Often had one hundred bills, desiring prayers for the sick, been read in one day in one of our assemblies. In one twelvemonth about 1000 of our neighbours have been carried to their long home." In 1702, 313 died of the disease, being about 4.4 per cent. of the inhabitants. In 1721, the disease broke out with great violence; and 5759 persons (more than half the inhabitants) had it in the natural way, of whom 844, or 1 in 7, died. Inoculation was then for the first time introduced, but not without great opposition; 247 were inoculated, of whom 6, or 1 in 42, died. In 1730, it was estimated that 4000 cases occurred, of which about one tenth were by inoculation. Of these about 500 died. In 1752, the disease again appeared in Boston, and became very fatal. The town then contained 15,684 inhabitants. Of these 5998 were supposed to have had the disease; 1843 re-

moved out of town. All the remainder, except 174, had the disease by inoculation or in the natural way. The following table illustrates the prevalence of the disease at that period:

Persons.	Natural.			Inoculated.		
	Cases.	Deaths.	Ratio per Ct.	Cases.	D'ths.	Ratio per Ct.
White..	5060	470	9.2	1985	24	1.2
Coloured	485	69	14.2	139	6	4.3
Both ...	5545	539	9.7	2124	30	1.4

Thus showing that the liability to death by this disease among the coloured was about 50 per cent. greater than among the whites, when taken by inoculation. The greatest number of deaths occurred in the months of May, June, July, and April. The disease occurred again in 1764, in 1776, in 1778, and in 1792. The town contained in 1792 about 18,000 inhabitants, of whom 10,655 were supposed to have had the disease; 262 removed out of town; and 221 only remained unaffected liable to the disease; the rest had it. The cases by the natural way and by inoculation were as follows:

Persons.	Natural.			Inoculated.		
	Cases.	D'ths.	Ratio pr. Cent.	Cases	Deaths.	Ratio per Ct.
White..	214	27	12.5	8804	157	1.7
Coloured	18	6	33.3	348	7	2.0
Both...	232	33	14.1	9152	164	1.8

The following table exhibits a view of the disease at different periods of its appearance in Boston since 1720:

Years.	Cases.	Deaths.	Rat. per 100 of the Pop.		Natural.			Inoculated.		
			Sick.	Died.	Cases.	Deaths.	Ratio per Cent.	Cases.	Deaths.	Ratio per Cent.
1721	6006	850	54.6	7.7	5759	844	14.8	247	6	2.4
1730	4000	500	26.6	3.3	3600	488	13.5	400	12	3.0
1752	7669	569	48.9	3.6	5545	539	9.7	2124	30	1.7
1764	5646	170	36.4	1.1	669	124	18.5	4977	46	.9
1776	5292	57	44.1	1.0	304	29	9.5	4988	18	.5
1778	2243	61	16.6	.4	122	42	34.4	2121	29	.9
1792	8346	198	46.0	1.0	232	33	14.2	8114	165	1.8

From 1811 to 1820, only 6 deaths occurred from the disease; from 1821 to 1830, only 8; and from 1831 to 1838, only 39; and most of these cases were at the hospital on Rainsford Island. It never appeared in the city as an epidemic until 1839, after the repeal of the law in 1836, which required persons who were affected by the disease to be immediately removed from the city to the hospital. Since then no sanitary regulations have existed to prevent its extension, except vaccination; and the consequence has been that the disease has existed at all times to the present, to a greater or less extent, in the city. In 1839, 60 deaths occurred; 115 in 1840; and 185 in the last five years (prior to 1846). In the winter of 1846 it was more prevalent and more fatal than at any time during the last 50 years. Vaccination is performed gratuitously by the Port Physician, under direction of the city, and there is connected with the House of Industry a small-pox hospital, to which paupers who are affected with the disease are removed. But these sanitary regulations are insufficient to preserve the city from its loathsome and often fatal progress. So many new emigrants are constantly coming to the city, who are unprotected by vaccination, that subjects are never wanting for its successful attack.—(Shattuck.)

Philadelphia, according to calculations made from the published statistics, exhibits rather less than 21 in every 1000 deaths from small-pox, during a period of 20 years; and although in some years, corresponding to those in which the disease prevailed with more than usual malignancy in New York, there was a considerable increase in the actual number of deaths, yet they bore the same proportion to the inhabitants as in the latter city. Small-pox prevailed during a few years with great severity, and the comparatively small number of deaths is an evidence of the protective power of the vaccine disease. Every variety, from the mildest varioloid to the most fatal confluent form, was to be found existing simultaneously—the former among those in whom the susceptibility had been partially destroyed, either by a previous attack or by vaccination, and the latter among those who had never been protected, all being equally exposed to the action of a high degree of contagion.

Similar results have been found in other cities of the Union, proving that the benefits of vaccination are to be seen mostly in the immense saving of human life, and not in the universal exemption of every individual vaccinated from an attack of small-pox when exposed to a highly malignant contagion. This exemption does not exist, in every instance, after an attack of small-pox itself; and individuals, with the most unequivocal evidences of having had the disease, have been again attacked, and have died, where it has prevailed with great severity.

The full benefits of vaccination, as Dr. Stewart remarks, are not to be found by seeking for them indiscriminately among the inhabitants of large cities, who are constantly exposed to the numerous causes which produce failure in the progress of the vaccine vesicle, but among those who enjoy all the benefits of professional skill, not only in the selection of proper virus, but also in ascertaining the proper development of the constitutional symptoms. We might, therefore, expect to find it in its most perfect state where these requisites are enforced, as in public institutions, and wherever the necessary measures are fully adopted. The following are a few of the results obtained from these sources, as collected by Dr. Stewart: In the year 1815 the small-pox appeared on board the U. S. frigate Guerriere; an inquiry was instituted by the surgeon, to ascertain whether those attacked had ever been vaccinated, when it was ascertained that none of them had ever been. Not one of the crew who had been vaccinated took the disease in any form.

In the Orphan Asylum of Charleston, S. C., which in the year 1829 contained 150 children, not a single case of small-pox or varioloid occurred during the prevalence of that disease, although no additional restriction was imposed upon their intercourse with the citizens. The aggregate number of children received into the different orphan asylums of Philadelphia, since their establishment to the beginning of the year 1841, is 4009, and among the whole there has been but one death from small-pox. This occurred some years since, out of 65 cases of the disease. The children were carefully examined, both with reference to the virulence of the affection and to their condition at the time of attack. Ten were without the usual cicatrix left by the vaccine vesicle, and the child that died was one of the number destitute of this mark.

In the city of New York, the total number re-

ceived in all the orphan asylums to 1845 was 2384; and, although the small-pox appeared in two or three of them, yet it was in a greatly modified form, and no deaths occurred from this cause. A similar result, also, is found in the House of Refuge, where 2657 children were received in 16 years; making a total number of 5041 children, inmates of these establishments, for a series of years, and not a single death from small-pox at any time occurred.

Baltimore also presents the like return, out of 3500 children admitted into the Alms House and different orphan asylums of that city during a series of years. But one death from small-pox has occurred in the entire number of children, over 11,000 in all, admitted into the above-named institutions in the course of 30 years previous to 1843, and there is no reason to believe that this child had ever been vaccinated. Compare with these the results of small-pox before vaccination was introduced, and its advantages will be readily seen.

The value of the discovery of vaccination, then, does not consist in its entirely preventing an attack of small-pox, but in disarming it of its terrors—in reducing the mortality to a very small amount—a result not obtained even by the small-pox itself, many more deaths having, as has been observed, occurred among individuals who had passed through that disease, than among those who had been protected by vaccination. The recorded statistics of Drs. Mitchell and Bell, of the result of their experience during the epidemic of Philadelphia, in 1823 and 1824, also prove this fact, which has been noted by others. Of 248 cases of small-pox and varioloid, 155 were unprotected, of whom 85 died; 64 *vaccinated*, of whom 1 died; 9 *inoculated*, of whom 3 died; 7 previous small-pox, of whom 3 died; 13 unknown—no deaths.—(*North Amer. Med. and Surg. Journ.*, vol. 11.)

When these results of the two methods are considered, how striking are the advantages of vaccination, not only in saving human life, but also in its direct tendency to exterminate a loathsome malady altogether; and when the many causes which are known to exist that influence the proper development of the vaccine disease, and the carelessness which must prevail in the thousands of instances of vaccination, are taken into account, far from having our confidence lessened, when the results do not accord with our most sanguine wishes, these circumstances should, on the contrary, strengthen our faith in the salutary influence of a remedy which still must be regarded as one of the greatest blessings to man. —(*A Practical Treatise on Diseases of Children*, by James Stewart, M.D. New York, 1845.)

Dr. Prela, of Italy, published a work at Milan in 1825, entitled "*Il Boa di Plino conjettura sulla Storia della Vaccinazione*," in which he seems to have proved, by passages from Pliny and Celsus, that vaccination was known in ancient times under the name of Boa, by which its origin from the cow is designated; and on this he has founded the ingenious hypothesis that the small-pox gradually developed itself by the action of the cow-pox on the constitution, so that the present removal and prevention of the complaint by vaccination is only to be considered as a return to the old state.]

Bibliog. and Refer.—*Rhazes*, De Variolis et Morbillis. Goet., 1781, and edit. by Dr. Greenhill for the Sydenham Society, 8vo, Lond., 1850; also, *Rhazes*, De Pestilentia, lib. v., in Haller, Biblioth. Med. Pract., vol. i., p. 376.—*Avicenna*, Canon, l. iv., fen. i., tract. 4, cap. 6.—*G. Pictorius*, De Peste et Papulis Puerorum, l. ii., 8vo. Basil., 1555.—*Fracostorius*, De Morbis Contagiosis, &c., cap. 2.—*N. Massa*, De Febre Pestilentiali, Petechiis, Morbillis, Variolis, &c. Venet., 4to, 1540.—Haller, Bibl. Med. Pract., vol. i., p. 532.—*Marcellus Donatus*, De Variolis et Morbillis, 4to. Mantua, 1569.—*A. Portius*, De Variolis et Morbillis. Append. ad Lib. De Peste, 4to. Romæ, 1585. —*S. Kelling*, Defensative against the Plague, Small-pox, &c., 4to. Lond., 1593.—Halleri, Bibliog. Med. Pract., t. ii., p. 311.—*Fernelius*, De Abditis rerum Causis, l. ii., cap. 12. (*Infect. of fœtus.*)—*Forestus*, l. vi., obser. 44. (*Infect. of fœtus.*)—*F. Alphani*, De Pestilentia, necnon de Variolis et Morbillis, 4to. Neap., 1577.—*A. Campolongus*, De Variolis. Venet., 4to, 1586.—*D. Lipsius*, Bericht von den Kinderblättern und Massern, 4to. Erf., 1624.—*C. Cachet*, Vray et asseuré Préservatif de Petite Vérole, 12mo. Jout., 1617.—*G. Horst*, Bericht von Kinderblättern und Massern, 8vo. Giessen, 1621.—*M. Blav*, Beschreibung der Kinderblättern, 12mo. Constanz, 1633.—*G. Dwinnes*, van den Kinderpocken en Massern, 8vo. Briel, 1651.—*A. Fueldez*, Observations curieuses touchant la petite Vérole, 8vo. Lyon., 1645.—*Chicot*, De Morbillorum et Variolarum Ortu et Causis, in Epist. et Dissert. Med., 8vo. Paris, 1656.—*D. Maxwell*, Nature the best Physician; a Poem (*a case of small-pox*), 8vo. Lond., 1656.—*T. Bartholinus*, De Variolis hujus Anni Epidemicis, 4to. Hafn., 1656.—*T. Whitaker*, An Elenchus of Opinions concerning the Cure of the Small-pox, 8vo. Lond., 1661.—*F. J. Quatroux*, De la Peste, du Pourpre, et de la Petite Vérole, 8vo. Paris, 1671.—*G. Harvey*, Of the Small-pox and malignant Fevers, &c., 8vo. London, 1685.—*Ranchin*, Traité de l'Origine, des Causes, &c., de la Petite Vérole, 8vo. Lyon, 1640.—*Sennertus*, De Febribus, l. iv., c. 12.—*J. Lampard*, A direct Method of ordering and curing People of that loathsome Disease, Small-pox, 4to. Lond., 1685.—*A. Porchon*, Nouveau Traité du Pourpre, de la Rougeole, et de la Petite Vérole, 12mo. Par., 1688.—*R. Morton*, Pyretologia, sive de Febribus inflammatoriis, Variolis, &c., 8vo. Lond., 1692.—*T. Byfield*, Discourse on the Rise, &c., of Small-pox and putrid Fevers, 4to. Lond., 1695.—*G. Harvey*, Treatise of the Small-pox and Measles, 8vo. Lond., 1696.—*D. Phillips*, Dissertation of the Small-pox (*Lat. and Engl.*), 12mo. Lond., 1702.—*J. Baagart*, Over de Kinderpocken en Masselen, 8vo. Amstel., 1710.—*W. Lynn*, An Essay towards a more safe and easy Method of curing the Small-pox, 8vo. Lond., 1714.—*Baglivi*, Prax. Med., l. i., cap. 9.—*J. Friend*, Historia Medicinæ, p. 304.—*F. Bellinger*, Treatise concerning the Small-pox, 8vo. Lond., 1721.—*J. Woodward*, State of Physic and Diseases, &c., 8vo. Lond., 1718.—*W. Lynn*, Some Reflections on the modern Practisers of Physic in relation to the Small-pox, 8vo. Lond., 1715.—*Jurin*, Philosoph. Transact., No. 373.—*Mortimer*, In ibid., No. 493.—*Dodd*, In ibid., No. 470.—*Watson*, In ibid., No. 493.—*Derham*, In ibid., No. 337.—*Hunter*, In ibid. for 1760. (*Infect. of fœtus.*)—*E. Strother*, Experienced Measures how to manage Small-pox, 8vo. Lond., 1721.—*R. Blackmore*, A Treatise upon the Small-pox, 8vo. Lond., 1723.—*Bonet*, Sepulchret, l. iv., sect. 1, obser. 60. (*Pneumonia an often fatal complication.*)—*J. Jurin*, A Letter containing a Comparison between the Mortality of the natural and inoculated Small-pox, 8vo. Lond., 1723.—*Friend*, Comment. de Febribus, p. 148.—De Purgantibus in secunda Variol. Confluent. Febre. Roter., 1720.—*W. Clinch*, Historical Essay on the Rise and Progress of the Small-pox, 8vo. Lond., 1724.—*R. Holland*, A short View of the Nature and Cure of Small-pox, 12mo. Lond., 1728.—*J. Chandler*, A Discourse concerning Small-pox, occasioned by Dr. Holland's Essay, 8vo. Lond., 1729.—*Heister*, De Mannæ Laudibus in Malis Variol. Constitutionibus. Helmst., 1725 and 1744.—*T. Fuller*, Exanthemalogia; or, an Account of eruptive Fevers, especially the Measles and Small-pox, 4to. Lond., 1730. —*J. G. De Hahn*, Variolorum Antiquitates, nunc primum e Græcis eruta, 4to. Brigæ, 1733; etiam, Carbo Pestilens a Carbunculis s. Variolis veterum distinctus, 4to. Utrat., 1736.—*T. Apperley*, Practical Observations in Physic, with a Treatise on Small-pox, 8vo. Lond., 1731. —*T. Lobb*, Treatise of the Small-pox, 8vo. Lond., 1731. —*W. Hillary*, A rational and mechanical Essay on the Small-pox, 8vo. Lond., 1735—*W. Douglas*, Practical Essay concerning the Small-pox, 8vo. Bost., 1736.—*C. Deering*, Account of an improved Method of treating the Small-pox, 8vo. Notting., 1737.—*M. Lister*, Tractatus de Variolis, 8vo. Genevæ, 1737.—*J. C. De la Metherie*, Traité de la Petite Vérole, 12mo. Par., 1740.—*R. Holland*, A short View of the Nature and Cure of Small-pox, 8vo. Lond., 1740.—*J. Drake*, Orationes tres de Febre intermittente, de Variolis, &c., 4to. Lond., 1742.—*P. Dodd*, Several Cases in Physic (*small-pox after inoculation*), &c., 8vo. Lond., 1746.—*R. Mead*, De Variolis et Morbillis, 8vo. Lond., 1747.—A Discourse on the Small-pox

and Measles (transl. by *Stack*), 8vo. Lond., 1748.—*P. De Valcarle*, De Variolis et Morbillis. Dresd., 1750. — *A. Sutherland*, Medical Essay on the Small-pox, 8vo. London, 1750.—*Huxham*, Opera, *pluries*.—*D. Maxwell*, Nature the best Physician in treating Small-pox. Lond., 1756.—*T. Thompson*, An Inquiry into the Origin, Nature, and Cure of the Small-pox, 8vo. Lond., 1752. — *Douet*, Traité des Fièvres malignes, de la Rougeole, et de la Petite Vérole, 12mo. Paris, 1753.—*B. Langrish*, Plain Directions in regard to the Small-pox, 4to. Lond., 1758.—*T. Frewin*, Some Reasons why a Person infected with the Small-pox may not be cured by Antidote, 8vo. Lond., 1759.—*D. Descherney*, An Essay on the Small-pox, 8vo. Lond., 1760.—*Royer*, Mém. sur l'Usage du Lait et de la Racine du Persil dans la Petite Vérole, in Gazette Salutaire, No. 44. Paris, 1761. — *S. A. Ponticelli*, Infortunj del Vajuolo, e Metodo de andarne al Riparo, 8vo. Parma, 1761.—*Watson*, Account of Experiments on the most successful Method of inoculating Small-pox. Lond., 1761.—*J. Wheeler*, A Treatise upon the Small-pox and Fevers, 8vo. Lond., 1761.—*Zeviani*, Sul Uso del Cortice Peruviano vel Vajuolo. Farenz., 1767.—*W. Bromfield*, Thoughts concerning the present Method of treating inoculated Small-pox, 8vo. London, 1767. — *Medicus*, Sur les Rechutes et sur la Contagion de la Petite Vérole. Munich, 1767.—*T. Dimsdale*, The present Method of Inoculating, &c., 8vo. Lond., 1767. — *Morgagni*, De Sed. et Caus. Morb., epist. xlix., art. 33, *et seq.* — *T. Glass*, Letter to Dr. Baker on the Treatment of Small-pox, 8vo. Lond., 1767.—*Anon.*, Letter to Dr. Baker on the Means of procuring a favourable Kind of Small-pox, 8vo. Lond., 1768. —*T. Glass*, A second Letter to Dr. Baker on the Treatment of Small-pox, 8vo. Lond., 1767. — *J. G. Krüniz*, Verzeichniss der vornehmsten Schriften von den Kinderpocken, 8vo. Leips., 1768. (*Gives the modern literature of small-pox.*)—*J. F. Gloss*, New Method of treating Small-pox, rendering the natural Small-pox as void of Danger as the Inoculated, 8vo. Lond., 1768.—*J. J. Paulet*, Histoire de la Petite Vérole, avec les Moyens d'en préserver les Enfans, &c., 12mo. Par., 1768; etiam, Mémoire pour servir de suite à l'Histoire de la Petite Vérole, 12mo. Par., 1768. — *Bayle*, Aphorismes sur la Petite Vérole, 8vo. Liege, 1769.—*N. May*, Impartial Remarks on the Suttonian Method of Inoculation, 8vo. Lond., 1770.—*H. A. Wrisberg*, Beyträge zur Pockengeschicte, 4to. Goettin., 1770.—*Brocklesby*, Economic. and Medic. Observat., &c., p. 345. — *P. De Cardis*, De Variolis ejusque Causa efficiente, 4to. Rom., 1773.—*Van Swieten*, Commentaria in H. Boerhaave Aphorismos, vol. v., p. 1, 4to. Lugd. Bat., 1772.—*J. Amar*, Instruccion curativa de las Viruelas, 8vo. Madrit., 1774.—*D. Cotunni*, De Sedibus Variolarum, 8vo. Neap., 1775.—*A. von Haen*, Abhandlung von der sichersten Heilungsart der naturlichen Pocken, 8vo. Wien., 1775. — *C. L. Hoffmann*, Abhandlung von den Pocken, &c., 8vo. Münster, 1776.—*Munien*, Ergo Variolarum Inflammatio ab omnibus aliis diversa, &c., 8vo. Par., 1777. — *J. Mudge*, Dissertation on the inoculated Small-pox, 8vo. Lond., 1777.—*Haller*, Biblioth. Chirurg., vol. i., p. 408. (*Shows softening of the tissues in Variola.*)—*P. A. Fries*, Warum die meisten Pocken im Gesichte ausschlagen, 8vo. Dusseld., 1780.—*P. A. Fries*, Von der Nothwendigkeit, das Ausbruchfieber der Pocken gehörig zu behandeln, 8vo. Münster, 1780.—*De Haen*, Rat. Medendi, &c., pt. ii., p. 95. (*Associated with Measles.*)—*C. Roe*, A Treatise on the natural Small-pox, &c., 8vo. Lond., 1780.—*Gilchrist*, In Edinb. Essays and Observat., vol. ii., p. 435. (*Opposes Inoculation.*)—*W. Black*, Observations, medical and political, on the Small-pox and Inoculation, &c., 8vo. Lond., 1781. — *Rush*, In Med. Observat. and Inquiries, t. v., No. 2. (*Var. virus will locally affect the protected when inoculated, and the pus thus locally produced will communicate the disease.*)—*T. Christan*, Beiträge zur Geschichte und Behandlung der naturlichen Pocken, 8vo. Wien., 1781. — *Ranoë*, In Act. Reg. Soc. Med. Hann., vol. iii., p. 249.—*Ström*, In ibid., vol. iv., p. 285.—*De Roussel*, Récherches sur la Petite Vérole. Paris, 1783.—*Way*, In Med. Observat. and Inquiries, &c., vol. v., p. 40. (*Pus from an inoculated sore in the protected imparts the disease.*)—*K. W. Greding*, Epistola de primis Variolarum initiis, earumque Contagione virulenta, 4to. Lips., 1781.—*F. Asti*, Memoria sul Vajuolo popolarm. vagato nella Citta e Provincia di Mantua. Fior., 1785.—*J. A. Unzer*, Abhandlung von den Pocken, 8vo. Halberst., 1782. — *Hallé*, In Mém. de la Societé Roy. de Médecine, ad 1784 et 1785, p. 423.—*J. Haygarth*, An Inquiry how to prevent the Small-pox, 8vo. Chester, 1785. — *Koehler*, Adversaria de Tussi convulsiva et Variolis. Erl., 1784.—*W. Lynn*, Case of a Lady who communicated the Small-pox to the Fœtus, 8vo. Lond., 1786.—*Home*, Facts and Experiments, &c., p. 89.—*A. Volpi*, Medicina teorica e practica sopra la Malattia del Vajuolo, 8vo. Nap., 1786.—*De Sallaba*, De Morbis Variolarum posthumis. Wien., 1788.—*J. F. Hildebrand*, Bemerkungen über die Pocken in 1787, 8vo. Bruns., 1787.—*Hufeland*, Bemerkungen über Blättern im Jahr 1788, 8vo. Leips., 1788. —*T. M. Adair*, Candid Inquiry into the Effects of the cooling Regimen in Small-pox, with Remarks on a Method used in Hungary, 8vo. Lond., 1790.—*Kite*, In Mem. of Med. Soc. of London, vol. vi., p. 23. (*Communicated to the fœtus.*)—*Turnbull*, In ibid., vol. vi., No. 27.—*Rainey*, Edinb. Med. Comment., vol. iii., p. 479.—*King*, In ibid., vol. iii., p. 480.—*Noël*, Traité historique et pratique de l'Inoculation, &c., 8vo. Rheims, 1789.—*F. G. A. Buchholz*, Analecta de Variolis, specimen i., 8vo. Gott., 1790. —*Saalmann*, Descriptio Variolar. et Morbill., &c. Münster, 1790.—*F. J. Goetz*, Traité complet de la Petite Vérole et de l'Inoculation, 12mo. Par., 1790. — *E. Umfreville*, The present State of Hudson's Bay. Lond., 1790. (*Describes the first appearance of Small-pox there.*)—*C. J. Gruner*, De Variolis et Morbillis Fragmenta medica, Arabum et Græcorum, 4to. Jena, 1790.—*T. Drummond*, In Edinb. Med. Comment., vol. xiv., p. 300. (*Recommends laudanum in confl. var.*)—*R. Walker*, An Inquiry into the Small-pox, medical and political, 8vo. Lond., 1790.—*Russel*, in Transact. of a Society for the Improvement of Med. and Chirurg. Knowledge, vol. ii., No. 6.—*J. J. van den Bosch*, Verhandeling over den Aart der Kinderpokjes, &c., 8vo. Rotterd., 1791.—Abhandlung über die wahre Beschaffenheit der Kinderpocken, &c., 8vo. Stendal., 1792. — *F. Olberg*, Beitrag zur Litteratur der Blättern, 8vo. Hal., 1791. — *Fordyce*, In Transact. of a Society for Advancem. of Med. and Chirurg. Knowledge, vol. i., art. i. — *G. G. Lassi*, Del Vajuolo, e della nuova Maniera di curarlo, 4to. Rom., 1791. — *Reil*, Memorab. Clinica, fasc. iii., p. 118, *et seq.*—*Anon.*, Advice to Parents on the Management of their Children in the natural Small-pox, and during Inoculation, &c. Newmarket, 1793.—*Rudolphi*, Bemerkungen, th i., p. 118. (*Says that the Jews are rarely marked by small-pox.*)—*J. W. Dedekind*, Curart der natürlichen Pocken. Holzmind., 1791.—*F. Orlandi*, De vera variolarum Causa, et de proprio eas curandi Methodo, 8vo. Rom., 1792. — *Osiander*, Denkwürdigkeiten, b. ii., p. 116. (*Complicated with worms.*) —*J. Haygarth*, A Sketch of a Plan to exterminate the Small-pox from Great Britain, 8vo. Lond., 1793.—*Van Genns*, De Morbo varioloso, ejus Causis et Stadio vero primo. Groning., 1794. (*Experiments on the pus.*)—*W. Woodville*, The History of the Inoculation of the Small-pox in Great Britain, 8vo. Lond., 1796.—*Pallas*, Reisen, b. iii., p. 52, 242. (*Very fatal among the Ostiaks and Tungusee.*) — *C. W. Hufeland*, Bemerkungen über die Blättern, &c., 8vo. Leips., 1798. — *J. Hamilton*, Occasional Reflections on the Small-pox, &c., 12mo. 1799.—*P. F. Hopfengartner*, Beobachtungen über die Pockenkrankheit, 8vo. Stuttg., 1799.—*Thomann*, Annalen, p. 30. 1800. (*Associated with scarlatina.*)—*R. N. Desgenettes*, Avis sur la Petite Vérole, 8vo. Kaire., 1800.—*Marsillac*, Rapport de Trav. de la Société Philomatique de Paris, t. i., p. 136. (*A dog infected by licking variolous pustules.*) —*J. Eyerell*, Praktische Beiträge zur Geschichte der Kinderpocken, &c., 8vo. Wien., 1800.—*Bruel*, Hist. Variolarum quæ sub initio Anni 1807, Helmstadii Epidem. vagabantur, 8vo. Helmst., 1807.—*Jahn*, In Hufeland Journ. der Pract. Heilk., b. xiv., st. 4, p. 106.—*Joerdens*, In ibid., b. xiv., st. 4, p. 100.—*P. Frank*, De Curand. Hom. Morb., l. iii., p. 204.—*E. C. Duvillard*, Analyse et Tableaux de l'Influence de la Petite Vérole sur la Mortalité, &c., 8vo. Paris, 1806.—*T. Christie*, An Account of the Ravages of the Small-pox in Ceylon, 8vo. Chelt., 1811.—*E. Jenner*, In Transact. of Med. and Chirurg. Society, vol. i., p. 269. —*J. Moore*, History of the Small-pox, 8vo. Lond., 1815. —*Bryce*, In Edinb. Med. and Surg. Journ., vol. vii., p. 410, 1811.—*A. Monro*, Observations on the different Kinds of Small-pox, 8vo. Edinb., 1818.—*J. G. Crosse*, A History of the variolous Epidemic in Norwich in 1819, 8vo. Lond., 1820. Analyzed in Med. and Chirurg. Review, vol. i., p. 300.—*J. Thomson*, An Account of the variolous Epidemic in Edinburgh, 8vo. Edinb., 1820. — *Monfalcon*, Dict des Sc. Méd., art. *Variole*, t. lvii. Par., 1821.—*M. Deslandes*, In Revue Médicales, t. iii., p. 329. 1825. (*Description of the pustules.*)—*Guersent*, Dict. de Méd., art. *Variole*, t. xxi. Paris, 1828.—*R. Macleod*, In Med. and Phys. Journ. for July and August, 1820.—*Bampfield*, In ibid., vol. xlvii., p. 269.—*G. Gregory*, Cyc. of Pract. Med., art. *Small-pox*, vol. iv. Lond., 1834; and Lectures on the Eruptive Fevers, &c., 8vo. Lond., 1763; and same Work with Notes and Appendix, by *H. D. Bulkeley*, 8vo. New York, 1851.—*Hufeland*, On the Small-pox Epidemic of Berlin in 1823 and 1824, in Révue Médicale, t. ii., p. 131. 1825. — Ibid., p. 20, Avr., 1824. (*Lesions in fatal cases —arachnoiditis, pustulæ varioloidiformæ apud intestinum rectum, tunicamque bronchiorum mucosam, &c.*) — *Meyranx*, In ibid., t. iii., p. 463. 1825.—*Martinet*, In ibid., t. iv., p. 166–185. 1825.—*Tanchon*, In ibid., t. iv., p. 522. 1825.—*Devilliers*, Ibid., p. 522.—*J. Kinnis*, A Report of Small-pox as it appeared in Ceylon in 1833–34, &c. In Edinb. Med. and Surg. Journ., vol. xlvi., p. 230. (*Illustrative of the partial protection afforded by vaccination, and the distinct nature of variola and varicella.*)—*P. C. Delagarde*, In Transact. of Med. and Chirurg. Society,

vol. xiii., p. 163.—*T. Bateman*, In ibid., vol. ii., p. 31.—*G. Gregory*, In ibid., vol. xii., p. 234.—*H. Ancell*, In ibid., vol. xxi., p. 148.—*Bosc*, In Archives Générales de Médecine, t. xix., p. 385.—*Ludors* and *Mohl*, In Edinb. Med. and Surg. Journal, vol. xxix., p. 178.—*Dance*, In Archives Génér. de Med., t. xxiii., p. 481. (*Var. post Vaccinam.*)—*Babington*, In Guy's Hospital Reports, vol. i., p. 159.—*Schæffre*, In Medico-Chirurg. Review, p. 611. Jan., 1838.—Small-pox in Vienna, In ibid., p. 500. Oct., 1836.—*Robert et Wagner*, In Journ. Hebdom. de Méd., t. ii., p. 445.—*Blaud*, Nouv. Biblioth. de Méd., t. i., p. 303. 1826.—*Dufresne*, Archives Génér. de Méd., t. ix., p. 237.—*Polletin*, British and Foreign Med. Review, p. 250. July, 1836.—*Glehn*, In ibid., p. 219. July, 1837. (*Complicated with scarlatina.*)—*Wendt*, In ibid., p. 207. Jan., 1838.—*Petzholt*, In ibid., p. 469. April, 1838.—*Streeter*, In Lancet, p. 611. Jan., 1838. (*Small-pox in puerperal women.*) Dublin Journ. of Med. Science, p. 481. Jan., 1837. (See also the BIBLIOG. AND REFER. to *art.* VACCINATION.)

[AM. BIBLIOG. AND REFER.—*Stephen Brown*, M.D., Prize Dissertation on Small-pox, Varioloid, and Vaccination, p. 84. Oct., 1824; and Med. Recorder. (Dr. B. maintains that the *kine-pox* in the cow and the *grease* in the horse are both the results of variolous infection, and that each proves equally effectual in protecting the system against the small-pox.)—*Lewis C. Beck*, An Account of Small-pox, Varioloid, and Chicken-pox, which prevailed in Albany in 1824; with Remarks on the Identity of these Diseases, and the anti-variolous Power of Vaccination, New York Med. and Phys. Journ., vol. iv., p. 31.—*J. Smyth Rogers*, On the Varioloid Disease, New York Med. and Phys. Journ., vol. iii., p. 66.—*John Bell*, An Account of Small-pox in New York in 1823-24, Ibid., p. 199.—*Henry W. Ducachet*, On Vaccination, New York Med. and Phys. Journ., vol. i., p. 42.—*E. J. Coxe*, *D. Francis Condie*, and *C. D. Meigs*, Report on Small-pox in Phila., North Am. Med. and Surg. Journ., vol. v., p. 400. (The committee come to the conclusion that the susceptibility to varioloid is not very greatly different under inoculation and vaccination, and they state that the varioloid attacked both variolated and vaccinated persons.)—*Moses Younglove*, On Small-pox and Kine-pox, Med. Repository, vol. vi., p. 372. 1803.—*Benjamin Waterhouse*, On the Inoculation of the Kine-pock, Ibid., vol. v., p. 373. (A very interesting account of the introduction of vaccination into this country.)—*Philemon Tracy*, Two Cases of Small-pox and Measles at same time, Ibid., vol. iii., p. 105.—*Joseph Hamilton*, Ibid., vol. iii., p. 194. Also, Monograph, 45 p., On Small-pox.—*Drs. Post, Hammersley, Neilson, Pascalis*, and *Watts*, Report on Epidemic Small-pox in New York in 1816, Eclectic Repertory, vol. vi., p. 304.—*John K. Mitchell* and *John Bell*, History of the natural and modified Small-pox, or of the Variolous and Varioloid Diseases as they prevailed in Philadelphia in 1823-24, North Am. Med. and Surg. Journ., vol. ii., p. 27 and 238. (A very elaborate and useful Report.)—Observations on Small-pox and Chicken-pox, with some remarks on Vaccination, New York Monthly Chronicle, p. 7. 1825.—*Pardon Bowen*, Facts relating to the Small-pox and Kine-pock, Med. Communications and Dissert. of Mass. Med. Soc., vol. ii. 1813.—*John Warren*, Mercurial Practice in Small-pox, Ibid., vol. ii., p. 476.—*Luther V. Bell*, An Attempt to investigate some obscure and undecided Doctrines in relation to Small-pox, Varioloid, and Vaccination, 8vo. Boston, 1836; and in Boston Med. and Surg. Journ., vol. xiv., p. 201.—*Pendleton*, In New York Med. and Phys. Journ., vol. i., p. 320.—*Post*, Ibid., p. 113.—*Nathaniel Potter* and *S. Calhoun*, Amer. Ed. of Gregory's Practice of Physic. Phil., 1831. (Dr. Calhoun maintains the identity of chicken-pox, cow-pox, and modified small-pox, vol. i., p. 221.)—*William Douglass*, A practical Essay concerning the Small-pox, 12mo, p. 38. Boston, 1730.—*Nathaniel Williams*, The Method of Practice in the Small-pox, with Observations on the Way of Inoculation, 12mo. Bost., 1752.—*J. C. Hutchison*, On Vaccination, and the Causes of the Prevalence of Small-pox in New York in 1853-54, New York Journ. of Med. and the Collateral Sciences, vol. xii., N. S.—*J. S. Smith*, A Review of epidemic Small-pox, as it has prevailed in New York City at different Periods during the last fifty Years, Ibid., vol. xiii., N. S.—*C. A. Lee*, Some Remarks on Small-pox, Varioloid, and Varicella, as connected with their Diagnosis, ibid., vol. xi., N. S.; and in Am. Journ. Med. Sci., No. ii., N. S. July, 1853.—*P. Macauley*, In Am. Med. Recorder, p. 378. Phil., 1822.—*S. A. Cook*, In Bost. Med. and Surg. Journ., vol. xxxii., p. 49.—*D. B. Slack*, In ibid., vol. xxix., p. 478.—*G. Dorrance*, In ibid., vol. xxii., p. 46.—*J. Bigelow*, In ibid., vol. xxi., p. 322.—*D. Palmer*, On Small-pox and Vaccination, In ibid., vol. xviii., p. 104.—*J. D. Green*, In ibid., vol. xvii., p. 325.—*James Spalding*, In ibid., vol. xiii., p. 167.—*H. Chandler*, In ibid., vol. xiii., p. 63.—*Thomas Wallace*, In ibid., vol. xi., p. 252.—*J. A. Allen*, In ibid., vol. x., p. 93.—*J. Stimson*, In ibid., vol. viii., p. 25.—*B. Cox*, In ibid., vol. viii., p. 33.—*J. D. Fisher*, Description of the Small-pox, Varioloid, Cow-pox, and Chicken-pox, illustrated by thirteen Engravings, 4to. Boston, 1829.—*J. V. C. Smith*, History of Small-pox and Varioloid in Boston, &c., in Bost. Med. and Surg. Journ., vol. i., p. 129, 161.—*W. B. Almon*, In ibid., vol. i., p. 7.—*B. Barrett*, In ibid., vol. i., p. 113.—*B. F. Joslin*, In ibid., vol. v., p. 249, N. S.—*L. Callaghan*, In ibid., vol. iv., p. 302, O. S.—*W. W. Gerhard*, In ibid., vol. xi., p. 368. (This paper contains the most accurate and minute account of the post-mortem appearances in Small-pox hitherto published.)—*J. F. W. Lane*, Some Statistics of Small-pox and Vaccination, in Ibid., vol. xxiii. (xii., N. S.), p. 119. July, 1846.—*William Kelly*, Case of Variola, complicated with Purpura, in New York Journ. of Med. Jan., 1851, N. S.; and in New York Med. Times, vol. ii.—*S. G. Morton*, In Am. Edit. of Macintosh's Practice.—*D. Hosack*, Lectures on Practice of Med. Edited by Rev. *H. W. Ducachet*, New York.—*Washington L. Atlee*, Case of Small-pox Contagion, apparently conveyed by Letter, Amer. Journ. Med. Sci., vol. xxvi., p. 505.—*Thos. Stewardson*, Remarks upon Small-pox admitted into City Hospital, Philadelphia, during 1840-41-42, Ibid., N. S., vol. v., p. 81.—*F. W. Sargent*, Report of Cases of Small-pox admitted into City Hospital, Philadelphia, in 1845-46, Ibid., N. S., vol. xvii., p. 349.—*Samuel Jackson*, of Northumberland, On Ectrotic Treatment of, Phil. Med. Examiner, N. S., vol. ii., p. 464.—*E. C. Banks*, of Illinois, Small-pox appearing Spontaneously, Ibid., N. S., vol. v., p. 518.—*Anonymous*, Observations upon Small-pox in Dover, N. H., Boston Med. and Surg. Journ., vol. xiii., p. 214.—*Henry Gibbons*, Sketch of Epidemic Small-pox in Wilmington, Del., Ibid., vol. ix., p. 355.—*W. L. Sutton*, of Kentucky, On Etiology and Diagnosis of Small-pox, Western Journal of Medicine and Surgery, 3d series, vol. ii., p. 93.—*T. S. Bell*, On Small-pox and Vaccination, Ibid., 3d series, vol. vii., p. 22.—Report of Committee on Small-pox and Varioloid, Transactions New York State Med. Soc., vol. iii., p. 40.—*William G. Meacham*, In Buffalo Med. Journ., vol. ix., p. 457.—*Samuel Forry*, A Dissertation on the protective Powers of Vaccinia, the Boylston Prize Essay for 1844, in New York Journ. Med., Sept., 1844.—*William P. Dewees*, Practice of Physic. Phil., 1833. Also, *G. B. Wood*, *R. Dunglison*, *D. Hosack*, *S. H. Dickson*, and *J. Eberle* (Systems of American Practice of Medicine).—*James Stewart*, On Diseases of Children, and Transl. of Billard on Diseases of Children.—*Lemuel Shattuck*, Report of Sanitary Commission of Mass. Mr. S. says: "The first authentic account of the prevalence of small-pox in this country is in 1631, when it spread from Narraganset to Piscataqua, and westward to Connecticut River, sweeping off whole villages of the Indians. In 1633 it also made great ravages among the natives; also in 1639, 1645, 1677, 1678, and 1702, when 4.4 per cent. of the inhabitants of Boston died of it. In that year *inoculation* for small-pox was introduced into Boston. Rev. Dr. Cotton Mather, having read in the Transactions of the Royal Society of London favourable accounts of the operation, recommended a trial of it to the physicians of Boston, but all of them unanimously and decidedly opposed it, except Dr. Boylston. This enlightened physician first inoculated his own son, thirteen years of age, then two coloured persons in his family, and all with complete success. Subsequently others were inoculated. Great controversy ensued, and the dispute ran high. Theologians maintained that such interference with the disease was sin, and should not be allowed. Dr. Douglass headed the opposition, and so exasperated were the minds of the people, that Dr. Boylston was frequently insulted in the streets, and forced to secrete himself for some time, and afterward to visit his patients only at night. Passion and prejudice on the one side, however, were met with decision and success on the other; and inoculation soon triumphed over opposition, and became general. During this epidemic, 15,759 persons—more than half the inhabitants—had the disease in the natural way, of whom 844 died; 247 were inoculated by Dr. Boylston, and 39 by other physicians, of whom 6 only died. This was 1 death in 7 of those not inoculated, and 1 in 47 of those inoculated, showing very clearly the advantages of inoculation."]

SOFTENING OF STRUCTURE.—SYNON.—*Softness of organs*; *Mollities*; *Μαλακότης* (from *μαλακός*, mollis); *Structuræ mollities*; *μαχαροσαρκος*, Galen. *Ramollissement*, Fr. *Erweichung*, *malacia*, Germ.

CLASSIF.—GENERAL PATHOLOGY—MORBID STRUCTURE—THERAPEUTICS.

1. *An individual structure, or part, or organ, may present more or less softness, or diminution of its healthy or normal density, or of its natural state of vital cohesion*; it may be preternaturally soft, still retaining its usual amount of cohesion; it may be unusually friable, without being soften-

ed, or without losing its density; but these states are comparatively rare, for when the one property is impaired the other is also diminished, and *with softening cohesion is generally proportionately lessened.* Softness of structure is commonly not merely physical, but also vital. The structure evinces an impaired cohesion of its molecules, and a diminished vital resistance to external agents. When treating of the changes evinced by individual structures, I have always described, as one of these changes, diminution of their cohesion, or softening. Thus softening of the brain, *Mollities cerebri*, is considered in the article Brain; softening of the heart, *Cardiomalacia*, in that on the Heart; softening of the stomach, *Gastro-malacia*, in that on the Stomach, &c.

2. I. Pathology of Softening of Structure. — *Preternatural softness of structure* is sometimes recognised during life, but most frequently comes under the observation of the physician after the dissolution of his patient, and it then becomes sometimes a question how far it may be a post-mortem change. There can be no doubt that much of the softness often found in the brain or spinal cord after death is post-mortem, although the change may have commenced some time before death; and this remark equally applies to softening of the tissues of the *digestive canal.* (See this art., § 34, *et seq.*)

3. *Softening of structure may occur after death.* —1st. From the action of the gastric juice on parts with which this fluid is brought in contact soon after, or at the time of dissolution. 2d. From infiltration or maceration of effused fluids, and putrefaction.

4. Softening may take place *during life.*—1st. From congestion, and, still more manifestly, from effusion or infiltration of blood in the structure. 2d. From inflammatory action. 3d. From disease of the arteries or veins connected with the softened part. 4th. From impaired organic nervous power of the part, causing impaired nutrition, sometimes with serous infiltration, or with fatty degeneration, or with a certain amount of either of these. Softening of structure after death has been noticed when treating of changes observed in the digestive canal and in other organs; but I shall here offer a few remarks on the pathological conditions of which it is a consequence during life.

5. i. The several changes just enumerated as most frequently producing softening of structure are chiefly concerned in causing this effect in particular organs or parts. But there are other states which occasion a *more or less general softening or loss of vital cohesion in most of the structures of the body;* and this softening may exist in a very remarkable degree throughout the whole frame, excepting the bones. It is presented to us during life chiefly in pestilential diseases and malignant fevers, and occasionally as a result of virulent poisons. The softening of the structures in these distempers is a consequence, as I have shown when treating of these distempers, 1st, of impaired and vitiated organic nervous influence; 2d, of a contaminated state of the blood, with an impaired crasis of its fibrine, and change of the blood-globules; these two prime factors of ulterior alteration acting and reacting on each other. The softening of structure in the more severe cases of the several pestilences, and in the more malignant of exanthematous and continued fevers, had been in great measure overlooked until I described it in early parts of this work and in other places; and to what I have advanced respecting these diseases, under their several heads, I must refer the reader for my description of this remarkable change—this general diminution of vital cohesion of the tissues—at an advanced stage of the malady, or towards the close of life, with the rapid accession of putrefaction after death. This general and rapid form of softening may be called *acute general softening of the tissues*, to distinguish it from *partial or limited softening*, on the one hand, and from *chronic general softening* on the other.

6. ii. When softening of structure is *partial as to its seat*, or *limited to a single structure or organ*, it is a consequence of one or more of the pathological states enumerated above (§ 4).—*A.* It may be the result, or the concomitant, of *congestion of blood* in the capillaries of the part, or of an *exudation of blood* from these vessels, and of the infiltration of it in the substance of the part. When the vital or the organic nervous influence of the part and of its vessels is impaired, the blood is liable to congestion in the vessels, or to farther change; and, as a consequence, or as a concomitant of this state, softening of the part is liable to supervene. If, as a result of this change in the capillaries and their contents, blood be effused into the structure of the part, softening still more certainly ensues, and with a rapidity proportionate to the failure of vital power and resistance in the surrounding parts. The softening which is observed is congested and enlarged spleen, whether occurring primarily, or as a consequence of periodic fevers, and some of the cases of softening of the lungs are illustrations of the consequences, or of the concomitant effects, of congestion of a simple or asthenic kind; while the red softenings seen in portions of the brain, and the softening with ecchymoses and bloody infiltrations, observed in several viscera and structures in scurvy, purpura, asthenic hæmorrhages, and in malignant or putro-adynamic fevers, &c., show the great extent to which softening proceeds when it is accompanied with exudations of blood. In all cases, when blood is exuded, infiltrated through the structure, or accumulated in masses, and retained even for a short time, softening of an inflammatory kind, although asthenic as to tone, certainly supervenes, and extends more or less, according to the grade of vital resistance.

7. *B. Inflammatory action* is generally attended by softening of the affected parts; and when softening has not become apparent, or even when the part seems more dense, owing to the infiltration of a concrescible lymph, there is a defect of vital cohesion, as evinced by increased friability. The sthenic and chronic states of inflammation evince less softening and friability than the more asthenic and acute states. Erysipelas and other spreading inflammations, and still more the diffusive inflammation of cellular and adipose tissues, are often attended by softening, amounting to diffluence and disorganization; and in proof of these changes, I have only to refer to these maladies, and to the art. Gangrene.

8. *C. Disease of the arteries and veins*, especially of the former class of blood-vessels, is a very common cause of limited softening of organs. Obliteration of an artery, or even specific deposits in the coats, or other changes affecting the calibre, or impairing the healthy action of the vessel, as atheromatous or fatty deposits, may impair the nutrition of the part supplied by the diseased vessel,

and thereby occasion softening and impaired vital cohesion of it. Instances of this connexion or sequence, or even sometimes concomitance of alteration, are often presented in the brain, heart, and other parts. Softening in these cases, more especially in the heart, is sometimes associated with a fatty degeneration of the structure of the organ. (See the chapter, in the article HEART, *on fatty degeneration of its structure*, § 224, *et seq.*) I have stated, when treating of *apoplexy*, that the change in the vessels of the brain, and in those of the heart, are sometimes the same at advanced age; and that whether the change be specific deposits in, or atheromatous or fatty degeneration of, the coats of the vessels, they frequently exist in the vessels of both these organs, and account for the not infrequent complication of disease of the heart with either apoplexy or palsy.

9. When the change in the arteries consists of atheromatous deposits in their coats—which deposits were described by me in 1830, when writing on the diseases of arteries, and were stated to "consist of a suety matter, greasy to the touch," &c. (*see art.* ARTERIES, § 59)—then the structures supplied by arteries thus affected are often not merely softened, but also otherwise changed; the softened part being flabby, and as if infiltrated with serum, and with more or less oil-globules. In other cases, especially when this change in the arteries is connected with softening of the cerebral structure, serous effusion often accompanies it, especially into the adjoining ventricles, and occasionally as an infiltration of the softened structure; this effusion being probably the result of the physical condition of the organ, and either of the state of circulation in the part or in its vicinity, or of the atrophy sometimes attending softening. Whether or no softening of the cerebral structure is attended by more or less of fatty degeneration, as observed in the heart, has not been ascertained; but it is not improbable that the fatty elements, contributing in their various degrees to produce what has been recently, and not always correctly, described as fat (and of which the earliest notices are contained in various articles of this work, especially ARTERIES, § 59; DISEASE, § 135, *et seq.*; HEART, STRUCTURAL CHANGES OF, § 224, *et seq.*; PLEURA, § 100; SEROUS MEMBRANES), are more or less augmented above the natural standard in the softened structure of the brain; the healthy structure of the organ containing from three to eight per cent. of fat, which exists chiefly in the medullary structure.

10. Disease of, or obstructed circulation through the *veins*, produces softening of the tissues, the blood of which passes to the affected veins; but the softening generally presents peculiar characters. It is always attended by great congestion, or infiltration of serum, or ecchymoses, or by all three. The vital tone or cohesion of tissues thus circumstanced is already partially lost; and when they are subjected to any irritation, inflammatory action of an asthenic character is soon produced, which rapidly spreads, still farther softens the part, and ultimately destroys its cohesion and organization.

11. *D. The organic nervous influence* of a part is more or less impaired, either previous to, or in connexion with, the changes already noticed as productive of softening. But this influence may be impaired primarily, and chiefly, and independently of any of the changes now adduced. It is thus impaired either congenitally or hereditarily, or by the injurious agents in operation during early life; and the consequences are a preternatural softness and flabbiness, and impaired vital cohesion of all the structures, not excepting even the bones, which, as shown in rickets and scrofula, are not only slowly and imperfectly developed, but more or less softened, especially in their spongy parts. This *chronic form of general softening* may exist in the fœtus, without being hereditary; it may be hereditary, and yet not appear until some indefinite period after birth, as when it proceeds from scrofulous parents. It may be acquired from the nature or the supply of nourishment, or from the want of pure air, &c.; the scrofulous, or rickety, or tubercular habit of body being thereby produced in young subjects, and the scorbutic at more advanced ages. *Scurvy* furnishes one of the most remarkable illustrations of chronic general softening, or general impairment of vital cohesion, advancing in a slow and progressive manner, commonly in adults, *rickets* equally illustrating it in children. The general cachexy resulting from the *syphilitic poison*, or from *mercury* acting in poisonous doses or modes, or from the use of the *ergot of rye*, or from other poisonous substances, is chiefly characterized by softening, implicating more or less the whole of the structures, although manifested especially in certain tissues, particularly the cutaneous and cellular, the osseous and periosteal, the mucous, &c., and, in certain of these, passing extensively into *ulceration*, of which softening is a general antecedent.

12. *E. Softening often depends upon the association in various degrees of the foregoing morbid states*, especially those causing partial or limited softening, and, even when thus associated, in its slighter grades it may be transitory, as when it occurs from œdema, or saturation of the tissues of a part with serum. Such saturation may proceed from local weakness of the tissue, or of the capillaries supplying it, or from more general debility, or from local changes, as obstruction in the returning circulation of the part, or obstruction of the absorbents, causing this lesion. The serous infiltration may be soon removed, or it may persist, or it may increase, and the attendant or consequent softening may also increase, and even go on to disorganization; certain intermediate changes, however, sometimes appearing, especially asthenic inflammation. In these cases, the infiltration of serum, by its macerating property, weakens the vital cohesion of the tissue, or, by the possession of an irritating quality, induces a diffusive or asthenic inflammatory action, frequently passing into gangrene. The mere separation of the intimate structure of cellular or adipose parts, by the infiltration into it of an inorganized and inorganizable fluid, if continued long, tends to loosen the vital cohesion of the part; and when this fluid contains, as often occurs, excrementitious or injurious materials, the result is both increased and hastened, especially as it often also associates with it other changes, seated in the vessels supplying the part, tending most rapidly to gangrenous softening.

13. Œdema, or serous infiltration of the substance of the brain, whether the antecedent or the concomitant of softening of the cerebral structure (for it may be either the one or the other), generally induces and accelerates the softening process in this structure more remarkably than in any other organ; complete disorganization,

or decomposition, being thereby often rapidly induced.* Few parts, either by their physical condition or by the nature of their organization, are more frequently subject to serous saturation than the brain; and although the serous exudation is most frequently excessive between the membranes and in the ventricles—more or less fluid being always in these situations—still the excessive accumulation of it in the ventricles will often affect the vital cohesion of the surrounding structure, so as to predispose to, or occasion softening in this situation or in the vicinity, especially in the scrofulous diathesis and in rickety habits, in which the vital cohesion of the tissues is generally weak.

14. Congestions of blood in parts, asthenic and erysipelatous inflammations, the accumulation of excrementitial and irritating materials in the circulation, and the operation of animal and contaminating poisons, all in their several grades occasion more or less softening, which is most remarkably manifested in those tissues, the organization of which is most loose or yielding, as cellular or mucous structures and parenchymatous organs. In these, especially, the softening is followed by the exudation of a fluid, which is neither pus nor concrescible lymph, even when the softening is most inflammatory, but which, in the scrofulous diathesis, is either tubercular, or curdy, or sanious, or an association of these; and in persons who are constitutionally exhausted, or whose blood is self-contaminated or otherwise poisoned, the morbid fluid, serous or sanious, infiltrates the adjoining tissues, softens them with various degrees of rapidity, and ultimately disorganizes or decomposes them. These consecutive states of softening, whether manifested in external or internal parts, in cellular and adipose tissues, or in mucous or parenchymatous organs, are presented to our observation in the course of adynamic or malignant fevers, and after the absorption of puriform and sanious matters into the circulation, and in the several forms of erysipelas; and whether puriform matter be formed in the softened part, or a sanious fluid, or a foul, contaminating serum, infiltrating adjoining parts, they always tend to farther disorganization, or decomposition or gangrene supervenes, unless vital power and resistance be re-enforced, and the contaminating state of the circulation be counteracted or remedied by suitable treatment.

15. II. THE THERAPEUTICAL INDICATIONS applicable to softening of structures should be based upon the pathological states from which it appears to proceed, or with which it is associated. But the result of treatment will entirely depend on the acumen of the physician in detecting this condition of structure and the changes in which it originates, and in attributing to each its due influence, and in adapting his means of cure to their several grades and relations. When treating, under their proper heads, of the several states of softening, as manifested in different structures, I then pointed out the measures most appropriate for each; and, reviewing this lesion as one of the most advanced, and as one of the most dangerous, I then more especially considered the treatment most conducive to the removal of the changes from which it proceeds. Whether arising from inflammations, especially the asthenic—or from congestions, hypostatic or others—or from obstruction of vessels, arterial, venous, or lymphatic—or from morbid matters conveyed into the circulation, and thereby affecting predisposed or previously disordered parts—or from the diminution of certain elements necessary to vital density or cohesion, as phosphorus, or sulphur and their combinations—or from morbid poisons changing the states of organic nervous power, and of the circulating fluids, more or less generally—or, lastly from the nature of the food and from states of nutrition—the treatment of softening of structure has received due consideration, as respects, not only this particular lesion, but also the changes from which it proceeds. In the several articles on ABSCESS (§ 62); ABSORPTION (§ 15, *et seq.*); ARTERIES (§ 40, *et seq.*); ARTS AND EMPLOYMENTS (§ 23, *et seq.*); BRAIN, *softening of the* (§ 214, *et seq.*); CACHEXY (§ 4, *et seq.*); CELLULAR TISSUE (§ 9, *et seq.*); CHOLERIC FEVER OF INFANTS (§ 11, *et seq.*); CONGESTION OF BLOOD (§ 12, 13,); DEBILITY (§ 25, *et seq.*); DIGESTIVE CANAL, *softening of* (§ 34, *seq.*); DYSENTERY, ASTHENIC (§ 88, *et seq.*); ERYSIPELAS (§ 64, *et seq.*); FEVER (§ 559, *et seq.*); GANGRENE (§ 57, *et seq.*); HÆMORRHAGE (§ 40, *et seq.*); HEART, *softening of* (§ 216, *et seq.*); INFLAMMATION, ASTHENIC (§ 236, *et seq.*); INTESTINES, *softening of*, (§ 131, *et seq.*); ŒDEMA, PESTILENCES, especially the Hæmogastric and Plague (*in numerous places*); and SCROFULA.

16. In the treatment of softening of individual structures, as well as of the general softening of the tissues consequent upon malignant fevers, and morbid states of the circulating fluids, attention should be chiefly directed to those pathological states of which softening is the consequence; and these ought to be either removed or counteracted by means suited to these states, the most important of which have been indicated above (§ 6, *et seq.*), or more fully mentioned in the articles just referred to. But it should always be remembered that the removal of the causes—a supply of deficient elements, in medicines, aliments, and mineral waters; a suitable diet and regimen; a pure, dry, and bracing atmosphere, with free ventilation; a healthy discharge of the digestive fuctions, and the use of pure or appropriate mineral springs—are the chief means of cure.

BIBLIOG. AND REFER.—*R. Hooper*, The morbid Anatomy of the Hum. Brain, illustrated by coloured Engravings of Organic Diseases of that Viscus, p. 17, 4to. Lond., 1828.—*Mirat*, In Dict. des Sciences Médicales, t. xliii., p. 161.—*L. Rostan*, Recherches sur une Maladie encore peu connue, qui a reçu le nom de Ramollissement du Correau, 8vo. Paris, 1823.—*Lallemand*, Recherches Anatomico-pathologiques sur l'Encéphale et ses Dependances, 3 tomes. Paris, 1820.—1836, *pluries*.—*R. Carswell*, On Softening of Organs, in Cyclop. of Pract. Med., vol. iii. p. 1.—*A. Grisolle*, Traite Elementaire et Pratique de Pathologie Interne, 8vo, 2 vols., 4th edit. Paris, 1850, *pluries*.—*J. Vogel*, Icones Histologiæ Pathologicæ, Tabulæ Histologiam Pathologicam Illustrantes, &c., Latin et Germ., 4to. Leipsig, 1843, *pluries*.—*J. Vogel*, The Pathological Anatomy of the Human Body. Transl., with additions, by G. E. Day, p. 405, 8vo. Lond., 1847.—*P. C. A. Louis*, Memoires ou Recherches Anatomico-Pathologiques sur le Ramollissement, &c., 8vo. Paris, 1826.—*Cruveilhier*, Anat.-Patholog. du Corps Humain, &c., 2 ts. folio. Paris, 1830-42, *pluries*.—*C. Rokitansky*, A Manual of Pathological Anatomy. In four volumes. Transl. for the Sydenham Society, 8vo. Lond., 1849-50, *pluries*.—*E. A. L. Hübener*, Specielle Pathologie und Therapie, b. I., p. 58, 8vo. Erlang.—These, as well as other authorities, may be consulted, but different views have been taken by them of softening of structure from those enter-

* It is not improbable that softening of the nervous centres is favoured, if not caused, by a deficiency of sulphur or of phosphorus, or both, and of their combinations, in the cerebral structure, these substances being always present, but in varying quantity in this structure, in its normal states.

tained by the author. (See also Bibliography and References to the Articles just referred to, as well as to others in which softening of individual structures is treated of.)

[*S. D. Gross*, Elements of Pathological Anatomy.—*W. E. Horner*, Path. Anatomy.]

SPASM. — Synon. — *Spasmus*, σπασμος (from σπαω); *Hyperkinesia* (from ὑπὲρ, and χίνησις). I. Frank; *Mobilitas nervosa nimia*, Auct. var. *Ataxia Spirituum: Spasmes*, Fr. *Krampfe*, Germ. *Cramp*.

Classif.—II. Class, II. Order (*See Preface*).

Definit.—*Involuntary or abnormal actions of muscular parts; or, in other words, contractions of muscular structures, different in continuance, or in severity, or in recurrence from healthy action; constituting a generic pathological condition; and although most commonly a sympathetic, yet an important morbid state.*

1. I. Varieties of Spasm.—The ancients comprised under the term spasm all convulsive affections or movements, but the sense in which the word is now and more strictly applied is the contraction or tension of a muscular structure, independently of volition, and often disposing to or followed by convulsion. Spasm, or cramp, frequently exists without convulsion; it may affect either voluntary or involuntary muscles; and in either of these situations presents varying characters; and it may be attended by consciousness, or by an abolition of sensation, or even by various derangements of sensibility and mental manifestation. The supporters and followers of the nervous system of pathology, especially Stahl, Hoffmann, Juncker, Sauvages, Cullen, and others, attached great importance to this morbid condition, and sometimes inferred its existence, especially in internal and involuntary structures, where there was no evidence of its presence. Although the partial revival of the humoral pathology, to which the early articles of this work have in no small measure contributed, especially those on the Blood, on Disease, on Absorption, Excretion, Infection, &c., has in some degree diminished the importance which had been attached to spasm as an influential pathological state, still it performs a part of considerable interest in the general doctrine of disease.

2. Sauvages arranged under spasm all involuntary muscular contractions, and divided them into *tonic* and *clonic*. Under the former appellation he comprised those contractions which were more or less permanent or continued; under the latter he ranged those which alternated with relaxation; and both forms of spasm he divided into *partial* and *general*. *Partial tonic spasm*, according to him, embraced strabismus, trismus, torticolis, priapism, and cramp attacking any of the voluntary muscles. *General tonic spasm* consisted only of tetanus and catalepsy. *Partial chronic spasms* were carphologia, pandiculation, tremour, palpitation, &c.; and *General clonic spasms* were eclampsia, epilepsia, hysteria, chorea, &c. Cullen adopted the view of Sauvages, in constituting spasmodic affections a distinct order of nervous diseases. Pinel, however, did not consider that the spasmodic state should be made the basis on which an order of disease might be founded.

3. It is very doubtful whether or no catalepsy should be viewed as a species of general tonic spasm, or even as a spasmodic affection at all. I have seen several cases of true catalepsy, and in these there was no increased action of muscles apparent. In cataleptic ecstasy, however, many of the voluntary muscles are more or less contracted; and when catalepsy occurs in connexion with hysterical attacks, muscular contractions often precede the cataleptic state. In most of the convulsive affections arranged under eclampsia, epilepsy, and hysteria, the seizure is generally tonic at its commencement, and clonic towards its termination; so that it is very difficult to distinguish between those convulsive or spasmodic affections which are tonic or which are clonic, these terms being altogether conventional, and the morbid states which they are intended to represent passing gradually and insensibly from the one into the other.

4. MM. Pinel and Bricheteau divided spasmodic affections into those which are unattended, and which are attended by lesion of the faculties of intelligence. Dr. Mason Good arranged these latter under the genus "*Comatose Spasm*," assigning convulsions, hysterics, and epilepsy to it, as species. But hysterical spasm is often unattended by any comatose affection, or loss of sensibility; and here, as well as in other morbid conditions, the difficulty of classification becomes apparent. Dr. Good divided his order of spasmodic affections, or nervous disorders affecting the muscles, into three genera, consisting of "Constrictive Spasm," of "Clonic Spasm," and of "Synclonic Spasm." The *first* of these comprised priapism, wry neck, distortion of the spine, muscular stiff-joint, cramp, locked-jaw, tetanus, rabies, and suppressed pulse; the *second*, hiccough, sneezing, palpitation, nictitation, subsultus, pandiculation; the *third*, tremour, chorea, shaking palsy, raphania and barbiers.

5. Dr. Good defined his genus "*Entasia*," or constrictive spasm, to be "irregular muscular action producing contraction, rigidity, or both." The genus *clonus*, or clonic spasm, he described as "forcible agitation of one or more muscles in sudden and irregular snatches," or, in other words, agitative or tremulous motions of the muscles. The genus *synclonus*, or synclonic spasm, he stated to be "tremulous, simultaneous, and chronic agitation of various muscles, especially when excited by the will," or a "multiplied conjunctive or compound agitation, or tremulous motion." The reader, upon consideration of the above definitions, will be at a loss to perceive the generic differences between the genera, clonus and synclonus, and he may not be satisfied that tremour and shaking palsy should be ranked as species of spasm.

6. Spasmodic action may occur in either voluntary or involuntary muscular structures. In the former it may be limited to one or more muscles, or extended to several, or even more or less generally; it may also, when so situated, be either simple, or associated with unconsciousness. In the latter class of structures, it is always partial or limited, and is generally complicated with irritation, or congestion, or inflammatory action, in adjoining or related parts. Spasm, moreover, is most frequently and strictly a *symptomatic* affection, and is rarely a *primary* or *idiopathic* disorder, unless when it occurs in the form of cramp, or from over-exertion of the muscles affected, or from bringing muscles that have been long disused into action.

7. Spasm may be arranged into, 1st, that affecting involuntary muscular structures, or those

parts which are supplied only or chiefly by ganglial nerves; 2d, that attacking muscles which are influenced by voluntary nerves; 3d, spasm implicating both involuntary and voluntary structures; and, 4th, spasm associated with want of consciousness. When spasm is seated in either involuntary or voluntary parts, it may be of varying duration; it may be continued for a time, and then permanently relaxed; it may be thus continued, and afterward recurrent or convulsive; or it may be recurrent or agitative from the commencement, thus presenting either of, or all the forms classed by Dr. Good as tonic, clonic, and synclonic, and being either partial, or limited, or more or less general. The limited states of spasm may be of considerable duration, and may even pass into a state of permanent contraction, although this may be a rare occurrence. Several of the unnatural positions of organs or parts, as those of the eye, extremities, &c., have been attributed to spasm of particular muscles; and probably the mal-position may have originated in this state, the contraction becoming permanent, while the spasm no longer existed; but it may have equally originated in a paralyzed condition of antagonist muscles. In these cases care should be taken to distinguish between tonic spasm, permanent contraction of muscles or parts, and the deficiency of antagonist action.

8. i. *Spasm of involuntary structures* is an element of several diseases. It is most common in the digestive canal, in various parts of which it may exist in succession, generally in a recurrent, although sometimes in a more continued form. It may be limited to this canal, or be extended to adjoining parts, or even to voluntary organs. It may, when affecting the alimentary canal, be merely an exaltation of the peristaltic motion, as in diarrhœa or dysentery; or it may be more severe, and attended by inverted action, as in vomiting, spasms of the pharynx or of the œsophagus. In these cases the spasmodic state is favoured either by extreme debility and sensibility of the seat of the disorder, or by inflammatory irritation, and is directly occasioned by any irritating substance. In any circumstance, the spasmodic action will be produced by irritations sufficiently great to excite it; and when the vital power of the parts is low, and the susceptibility great, even the accumulation of the natural secretions within these parts, or a vitiated state of the secretions, is sufficient to cause spasm, as evinced by certain states of diarrhœa, by vomitings, by colic, bilious cholera, &c. When any irritating body is brought in contact with the mucous surface of the digestive canal, whether that be gaseous, fluid, or consistent, spasm will generally affect the parts thereby irritated, or their more immediate vicinity. The same effect follows inflammatory action and ulceration, which are often followed by spasmodic action, as demonstrated in various parts of this canal, in the pharynx, the œsophagus, the stomach, the duodenum, the small and large intestines. Similar causes produce similar effects in the urinary passages, and even in the respiratory passages. In these latter the spasmodic action is often the most remarkable, and is generally followed by very manifest effects.

9. Various involuntary canals or parts have been supposed to be seats of spasm in certain disorders without sufficient reason. Thus the gall-ducts have been accused of spasm in some states of jaundice, and the capillary vessels in the cold stage of fevers. That irritating or morbid bile, or irritants at the mouth of the ducts in the duodenum, may cause spasm of these ducts, is very probable, but there is no palpable demonstration of this effect. That there is an apparent constriction of the capillaries, especially of those on the surface of the body, is very manifest in the cold stage of fevers and in states of vital depression; but it does not follow that the constriction is the consequence of spasm. It is merely the result of the contraction of these vessels upon a deficient amount, or the entire absence of their contents, which are no longer propelled with sufficient power to fill or distend them, during these states of the frame.

10. Spasm of the parietes of the cardiac cavities has also been inferred to be present in cases of nervous palpitation, and when death has taken place suddenly, without any manifest organic lesion. That nervous palpitation is truly spasmodic, even when most exalted, is extremely doubtful. There is certainly remarkably increased action and impulse, with all the symptoms described when treating this affection of the heart (*see art.* Heart, § 42, *et seq.*); but morbidly increased action is not quite identical with spasm, although often nearly approaching it. With increase of action, prolongation or irregularity of the contraction is generally present in the spasmodic state. If we admit the occurrence of spasmodic or spastic contraction of the parietes of the heart of a much longer duration than that which takes place normally, death must necessarily follow; but I much doubt the existence of this lesion, especially in such grade or continuance as to occasion death. It certainly has not been satisfactorily demonstrated, although admitted by some writers.

11. ii. *Spasm of voluntary muscles or parts* is of frequent occurrence, either in the form of cramps of particular muscles, or in that of convulsive action of several or many. Cramps in the extremities may follow over-action of the muscles attacked, or be symptomatic of disorder of the digestive canal, or of latent or inflammatory changes in the brain or spinal cord, or their membranes, or of the irritation produced by the circulation of effete or injurious materials in the blood, as in cholera, gout, &c. They may even follow a certain amount of pressure upon, or irritation of the nerves, supplying voluntary parts, either at the origins or in the course of these nerves, with or without any other manifest disorder. Cramps or spasm, of the lower extremities especially, often precedes, recurring at intervals, for some time an attack of paralysis or apoplexy, particularly hemiplegia; and they often recur, in slighter grades, during the restoration of the lost power. Spasmodic actions of voluntary parts may result from irritations in their vicinity, or in situations more or less remote, from irritations immediately affecting the nerves supplying these parts, or mediately and indirectly conveyed to them from a distance, as in trismus, tetanus, &c.; and the spasmodic action may be tonic or continued, or irregular or convulsive, or clonic or agitative, or recurring at intervals and occasioning snatches or startings, and various abnormal motions; or it may pass in succession through all those, as in irregular convulsions, in some forms of hysteria, and even in some cases of epilepsy. The spasmodic state, however, is subject to so many variations and anomalies, that

it is quite impossible to describe them correctly in all their details at this place. Those diseases in which spasm, in any of its forms, constitutes a principal element are fully described, and with especial reference to this morbid condition, under their special denominations; it is requisite, however, to notice certain associations of this condition.

12. iii. *Spasm may affect both involuntary and voluntary parts.* It may extend from one order of parts to the other—most frequently from the former to the latter, if the succession of morbid phenomena be closely analyzed, although voluntary parts manifest this disorder most evidently. Spasm, even when affecting most severely the voluntary muscles, may proceed from very remote sources of irritation, as I have shown in several places in this work before the subject was duly considered by any one else. Commencing with those sources which are the nearest to the parts which are morbidly contracted, and concluding with those which are the most remote, we find that muscular structures may experience unnatural action or spasm in some one of its varying forms: 1st, from irritation in or near the seat of morbid action, as shown more especially in muscular canals—in the digestive, respiratory, and urinary passages; 2d, from irritants affecting the nerves supplying the affected muscles, as evinced in both involuntary and voluntary parts; 3d, from irritation or lesion of the spinal marrow at or near the origins of the nerves supplying these muscles; 4th, from lesion (not necessarily structural) of parts of the brain, or of its membranes, having relations with the nerves going to the convulsed or spastic muscles; 5th, from irritation of any portion of the digestive viscera and canal, or of the generative and urinary organs, transmitted by ganglial nerves to the roots of the spinal nerves, or to the spinal cord, and reflected thence by voluntary nerves to the external muscles and members; 6th, from irritation of any of the senses—of hearing, sight, smell, taste, or touch—transmitted to those parts of the nervous centres with which they are respectively in connexion, and thence reflected upon parts intimately related to them; thereby producing startings, tremours, sneezing, cough, retchings, or convulsive movements, as either of these senses are irritated or abnormally excited. These several sources of spasmodic action have been sufficiently illustrated in the articles Chorea, Convulsion, Epilepsy, Hysteria, Sympathy, Tetanus, &c.

13. II. Causes of Spasm.—i. *The predisposing causes* are the same as those fully described when treating of the individual species of spasm, these causes being generally common to all the species, the exciting causes, and the several intrinsic circumstances or peculiarities of the patient determining the form of the attack. Hereditary vice or disposition, congenital conformation, a weak development of frame, the female sex, a warm and humid climate, the ages of infancy, childhood, and puberty, the critical epochs of females, premature sexual indulgence and masturbation, luxurious indulgences and voluptuous modes of living [the excessive use of tobacco and alcoholic stimulants], prolonged indulgence in bed or in sleep, inordinate devotion to music and poetical studies, excitement of the imagination, want of repose, mental anxiety, sleeplessness, exhausting discharges, the sudden suppression of accustomed evacuations, or of external pains; the gouty and calculous diathesis; excited and ungratified, or insufficiently gratified, sexual passions; suppressed emotions; the period of utero-gestation, the puerperal states, abortions, exhausting lactation, inanition; extreme states of vascular plethora, or of anæmia, &c., severally predispose, and often directly produce, some one or other of the usual forms of spasmodic disorder, or such states of spasm as may be considered as anomalous, or different from those commonly described by nosological writers.

14. ii. *The exciting causes of spasm*, whether specific or anomalous, are chiefly influences affecting the mind, the senses, the nervous centres, the alimentary canal and digestive viscera, the sexual and urinary organs, &c.; more especially the violent emotions of mind, whether manifested or suppressed; severe disappointments and losses; strong or strange impressions of the senses, startling noises, disgusting or horrible sights, objects of terror or surprise; violent excitement and the influence of the imagination; titillation or irritation of the more sensitive parts of the surface, prolonged or violent pain; disordered dentition and dental affections; derangements of the digestive canal, particularly the presence of worms, or of acidity, or of flatus, or of morbid secretions and excretions, or of fæcal accumulations; the passage of biliary calculi, or of disordered bile; irritation or excitement, or functional or structural lesions of the sexual or urinary organs or passages, calculi in the kidneys or bladder; inordinate or prolonged muscular action; various organic lesions or external injuries, implicating either the parts affected, the nerves supplying them, or related portions of the nervous centres or their membranes; sudden or extreme changes of temperature, or electrical conditions of the atmosphere; sudden suppression of discharges, eruptions, or external pain; the drying up of chronic ulcers; the nature of the ingesta, especially acid or unripe fruit, poisonous articles mistaken for food; the poison of lead, and numerous other injurious substances mentioned under the head of Poisons.

15. iii. *The immediate or efficient cause of spasm*—the pathological condition constituting this affection—has been a topic of contention among pathologists. It was generally ascribed to irritation of the nerves supplying the affected muscles, either at their origins, in their course, or at their terminations; or to a sympathetic affection of these nerves propagated from distant but related parts to those thus attacked; or to an irregular distribution through the nerves of the nervous influence or power, and determination of this influence to the affected parts. Towards the close of the last century, Ritter, Sprengel, and others viewed spasm as a result of an alteration of the polarization of the terminations of the nerves in relation to the muscular fibres; and this doctrine, after having been neglected for half a century, has been revived at the present day, and supported by the connexion established between magnetism and electricity. This latter theory may admit of a certain degree of practical proof, by having recourse to electricity or galvanism, or of electro-magnetism, for the removal of spasm, an energetic recourse to either of these overcoming, as it does in slighter cases, as shown by my own observation, the morbid condition of the muscles. Nevertheless, the same agencies may

be viewed as equally successful in the removal of spasms, on the assumption of their dependence upon the irritation of the nerves in any way related to the affected parts. The *juvantia* cannot always prove the nature of the affection. I have seen, as far back as 1820, the most severe cases of tonic and of clonic spasm produced by the internal strangulation of a minute portion of the small intestines, and by the irritation of worms in the bowels, the violent affection of the voluntary muscles having arisen from those causes and ceased with them, the irritation having been propagated by ganglial nerves to the roots of the spinal nerves, and thence reflected upon the muscles in which these latter nerves terminated; the history of these and numerous other cases favouring rather the old doctrine of irritation of nervous distributions than the less old and recently-revived theory of altered polarization of the nervous fibres, with relation to the muscular tissue, in producing spasmodic actions.

16. III. Diagnosis of Spasm.—The existence or non-existence of spasm is in many cases remarkably evident; but in many others, even as respects some disorders which have been viewed as spasmodic, the evidence is by no means satisfactory. As to the insufficiency of this evidence in regard of some disorders, I have already hinted. We have no proof of spasm in any quarter in cases of *catalepsy* of a true pathological form; at least, I could detect none upon a close examination of several cases. The several forms of true *tremour*, as arising either from mental emotion, or from mineral or other poisons, or from functional or structural changes, evince no true indication of spasm. The disordered motion is merely the result of an imperfect determination or transmission of nervous power to the tremulous parts, owing to an insufficient or an interrupted supply of this power from the voluntary or involuntary nervous sources, as either voluntary or involuntary parts are affected.

17. Various *paralyzed parts* may present states which may be mistaken for spasmodic affections; and the paralyzed state may rapidly pass into the spasmodic, and this latter into the former, which is much the most common. The existence, the morbid relations, and the translations of both these morbid conditions thus become extremely imperfect. *Hysteria*, the *convulsions*, and other spasmodic and anomalous affections of infants and children; diseases of the brain, or of its membranes, in the same class of subjects; diseases or injuries of the spinal marrow, &c.; epilepsy, apoplexy, paralysis, &c., either frequently or occasionally, present more or less of spasmodic action, often passing suddenly or rapidly into one of entire loss of power. The irritation, softening, effusion, compression, or other original morbid change affecting the nervous centres, while slight, or in a lesser degree, may occasion only cramps (spasmodic motions), but, when increased relatively to the state of nervous power, may cause the loss of all motion. We thus often observe that several maladies commence with more or less of spasm, or cramps in the extremities, especially the lower, and soon pass into the paralyzed state; apoplexy, epilepsy, paralysis, and various other specific and anomalous affections of the nervous system, manifest in many instances this succession of lesion and of resulting phenomena.

18. Dr. M. Hall is of opinion that the spasmodic affections ushering in many cases of these maladies commence, or are seated, in the superficial muscles of the neck; and that the spasm of these muscles, by compressing the larger veins, occasion congestion of the brain, and the several consequences of congestion when the spasm is not soon relaxed. He believes that "certain causes and principles, emotions and irritations, act directly or diastaltically upon the muscles of the neck," inducing what he designates "*Trachelismus:*" "if this spasm can be dissolved, all its effects cease more or less perfectly." That the muscles of the neck are affected with spasm in many cases of hysteria, especially in the more severe or paroxysmal, cannot be doubted; and that those seizures which originate in violent mental emotions are often thus characterized, or even thus originate, may be conceded; but the spasm of these muscles is not so general, nor always so early in the procession of morbid phenomena, as Dr. M. Hall supposes. When it does exist, and is either severe or protracted, the consequences which follow are generally serious; and it then constitutes an important portion of the courses of morbid actions and changes, each successive portion being the cause of that which follows it, as it is itself the consequence of that portion which precedes it.

19. Spasm of involuntary muscles must necessarily be imputed to irritation of the ganglial nerves supplying these muscles, or to some alteration in the relations subsisting between the nervous and muscular fibres of the affected part. But when spasm attacks voluntary muscles, the irritation has been generally supposed to be seated in, or to implicate, the voluntary nerves. It is, however, very doubtful whether the spasm of these muscles is so generally caused by irritation of voluntary nerves as is commonly believed. It is very probably so caused in many cases, as shown by injuries of the spinal cord, and by inflammation of this part of the nervous system or of its membranes; but there are various diseases, in which spasm performs a chief or a subordinate part, where irritation of any part of the voluntary nervous system is by no means demonstrable, either the muscular fibres or the ganglial nerves supplying them being much more probably the primary seat of such disorder. In trismus and tetanus, in which the voluntary muscles are so severely contracted, there is no proof that the voluntary nerves are primarily implicated; for volition produces no effect on the spasm, and whatever lesion these nerves present, in some cases merely, may be consecutive much more probably than primary. In the most severe cases of spasmodic cholera, in violent cases of colic or ileus, and in others where a very limited injury is sustained by a portion of intestine, as in partial strangulation, I have seen the spasm of the voluntary muscles as general as in tetanus, and continue in this state for long periods, and yet the cerebro-spinal nervous system must be inferred to have been free from all irritation but what was propagated to the spinal nerves from the ganglial nerves supplying the digestive canal.

20. IV. The Prognosis of Spasm may be most favourable, or the most fatal, according to the seat of spasm, and the circumstances in which it occurs. A spasmodic affection may terminate the life of an infant in a few seconds, especially when it is caused by disease about the base of the brain, or near the medulla oblongata, or their mem-

branes; or it may cease in a very few minutes, where it is produced by acidity or by any other source of irritation in the alimentary canal. Clonic spasm of the diaphragm may arise, especially in young persons, from the deglutition of a hard or imperfectly masticated substance, or from acidity, flatulence, &c., or it may be the indication of a fatal issue in many acute and even chronic diseases. It may proceed from inflammatory action or irritation of one or more of the digestive organs, or from the sinking of vital power preceding dissolution.

21. Spasm affecting either involuntary or voluntary parts is not attended by danger when it occurs in hysterical or nervous females, or when it cannot be traced to disease or injury of the brain, spinal marrow, or their membranes, or to antecedent or existing visceral disease, pectoral or abdominal. When, however, it has been preceded or is attended by inflammatory action or by hæmorrhage, or even by evidence of congestion of any important organ, or by effusion into any cavity, especially if hæmorrhage has been excessive or effusion great, spasms of any part, and more particularly if they affect the diaphragm, or even the pharynx, œsophagus, or stomach, are a most unfavourable, and generally a fatal, symptom.

22. Spasms of either voluntary or involuntary muscles are always indications of great danger when they appear in the course of malignant or other fevers, and especially in an advanced stage of those fevers, or when they are present in pestilential distempers, or at the commencement of acute inflammation of abdominal organs, or at an advanced stage of chronic visceral or structural disease; the amount and imminence of danger depending upon the violence or malignity of the disease, upon the contamination of the blood, upon the stage of the malady at which spasms occur, and upon their seats and extension. Spasms affecting the muscles of the superior extremities are always much more dangerous than those of the lower extremities, and, when they extend from the former to the latter, the danger is extreme.

23. Spasms of voluntary muscles attending gout or rheumatism are readily removed when they are caused by acidity and flatulence, or accumulation of morbid secretions and excretions in the intestinal canal or in the biliary organs; but when in these diseases spasm appears independently of the disorders just mentioned, or when structural change is detected in the heart, or when the state of the urine indicates disease in the urinary organs or passages, more or less danger should be apprehended; and although present risk may be averted, a future attack, with its contingent danger, may supervene sooner or later.

24. Spasmodic attacks consequent upon protracted lactation, upon menorrhagia, or profuse leucorrhœa, or upon other exhausting discharges, or upon manustupration or venereal excesses, or upon inanition or anæmia, are frequently temporarily removed by treatment; but they return or assume a more serious aspect, if the morbid condition in which they originate be not removed by appropriate means, or they may pass from the hysterical character, in which they generally first present themselves, into the epileptic or into mania or confirmed insanity.

25. Spasms occasioned by the extent or seat of injuries generally excite great anxiety, and are most frequently attended by danger. But the amount of danger, or even the absence of it, depends chiefly upon the nature and seat of injury, and the amount of vital shock (*see art.* Shock) attending it. When the cranium or spinal column is the seat of injury, when there is a penetrating wound or compound fracture, or when vital sinking indicates the violence of the shock sustained by the frame, the presence of spasm not merely complicates the injury, but also indicates its severity, and the imminent danger attending it.

26. V. Treatment.—It is obvious that the treatment of spasm should in a great measure depend upon the nature and seat of the disease, of which the spasmodic symptoms form either subordinate or a most prominent part. When the spasm is more than a symptom, depending upon some special malady—when it constitutes an early, predominant, or principal morbid condition, either with or without loss of consciousness, it presents, according to its antecedent or associated and peculiar phenomena, certain special forms, which are described under the several heads of *chorea, convulsions, epilepsy, hysteria,* &c., and for each of which, in its several varieties, the treatment is fully described. It therefore remains only to state those general principles or indications which experience indicates or contra-indicates, under certain circumstances and morbid conditions with which spasm is generally allied.

27. It would appear, from what has been stated above, that one or other of the different forms of spasm is contingent upon, or is produced by, one or other of the following pathological states: 1st, congestion; 2dly, inflammation; 3dly, irritation caused by acid, acrid, or otherwise disordered secretions and excretions; 4thly, a contaminated state of the circulating fluids; 5thly, some structural lesion or injury affecting adjoining or remote nerves or the origins of nerves; 6thly, extreme exhaustion of organic, nervous, or vital power; 7thly, the excessive action of muscles, and the contraction of muscles independently of a co-ordinate or sufficient determination of volition to them; 8thly, punctures or other injuries of tendons, nerves, or fibrous membranes; 9thly, the irritation of the sexual or urinary organs; and, 10thly, two or more of the states conjoined. It will be seen, from a consideration of these antecedents, that spasm is most commonly a symptom of certain disordered or morbid conditions, to which attention should chiefly be directed in its treatment, and that it is only when produced as just indicated in the seventh and eighth of the above series of causes or circumstances, that spasm can be considered as a primary or idiopathic disease. (*See arts.* Tetanus and Trismus.)

28. *A. Congestion,* in connexion with spasm, may be viewed both as an antecedent and associate of this latter condition. It may, moreover, be farther associated, as with irritation or some structural lesion; and as long as these are in existence, so long may the spasm continue or recur, as various concurring causes may favour its return. The existence of congestion is often difficult to determine; for when the spasm implicates any part of the respiratory apparatus, or when it is so general as to give rise to convulsions, with or without loss of consciousness, the congestion which is then made manifest is more the result of the spasm than the cause of it.

Congestion of the brain, or near its base, especially if consciousness be lost, and congestion of the lungs and cavities of the heart, are common effects of general spasm or convulsions, especially when any part of the respiratory passages is affected. Congestion may certainly exist in either organ antecedently to either spasm or convulsion, for it is frequently the cause of both; but the spasm may increase the congestion, and it may even be the cause of relaxing the spasm when the congestion becomes extreme. This latter effect takes place chiefly in extreme congestion of the brain, when consciousness is lost; the congestion, in connexion with the circulation of imperfectly oxydized blood in the brain, both relaxing the spasm and permitting the renewal of air in the lungs. The more moderate congestion in these cases first occasions spasm or convulsions; but when the congestion of unoxydized blood, increased by the convulsions, becomes extreme, then the spasms are relaxed and altogether resolved, and either natural respiration is resumed, or death takes place from the cessation of respiration, owing to the effect produced by the congestion at the origins of the respiratory nerves. In cases of spasm, thus arising or thus associated, the treatment must be directed by the following intentions: namely, 1st, to diminish or remove congestion by means which experience has shown to be most efficacious in obtaining this object; 2dly, to prevent the recurrence of this condition and its contingent effects.

29. *a.* Spasm depending upon or connected with congestion of any vital or important organ has been too generally treated by large vascular depletions, both general and topical. In young, robust, and plethoric persons, and when the spasms have been consequent upon the stoppage of accustomed discharges, both the one and other mode of depletion may be employed, but with extreme circumspection, more especially during the attack. In most even of these cases, local depletions are the safest and most efficacious; for when the circumstances just mentioned as warranting the depletion are not manifestly present, or when the patient is of a nervous temperament, either the local depletion should be small, or it should be altogether dispensed with, and other means be chiefly confided in. When local depletions are indicated, cupping is the most beneficial; and when the loss of any blood is justly dreaded, then dry-cupping may be resorted to. The circumstances indicating depletions, as well as those contraindicating them, require for their recognition great discrimination, guided by an enlightened experience, and are such, in their natures, complexities, and varied successions and associations, as to be estimated correctly only at the moment by the closely observing physician. When, therefore, there is any doubt as to the propriety of blood-letting, it will be preferable to resort to dry-cupping, and to emetics and purgatives, conjoined with stimulants and antispasmodics—with these latter more especially when nervous energy is much reduced or originally weak.

30. *b. Of emetics*, especially when spasm is imminent, or when it attacks any part of the respiratory apparatus, the most energetic is the *tinctura Lobeliæ*, or *Tinct. Lobel. Ætherea*, given with vinum ipecacuanha to ensure its emetic operation, or with sulphas zinci. When vital or nervous power is much reduced, it may be given with spiritus ammoniæ aromaticus, or with camphor.* When blood-letting is manifestly indicated, or when congestion of, or vascular determination to, the brain is urgent, then depletions and derivatives, as mustard pediluvia, should precede the exhibition of an emetic; and the affusion of cold water on the head, or cold sponging, may also be practised, the emetic operation and the relaxation of spasm being often promoted by these means. When congestion of the liver is connected with spasm, local depletion, or dry-cupping, or both, are often required, and then the preparations of colchicum may be given, at first in a large dose, either with or without an emetic conjoined, and afterward relinquished for purgatives and antispasmodics. The operation of the first dose of colchicum should be carefully watched, particularly when large, and if vital depression follow it, stimulating antispasmodics, as ammonia, camphor, valerian, &c., be exhibited. The spasms or convulsions which sometimes occur on the invasion of exanthematous fevers are often connected with congestion, and for these an emetic and a warm bath are often of service.

31. *c. Purgatives* are generally beneficial, more especially when the liver or brain is congested, and when the spasm is connected with acidity aud flatulence of the digestive canal, or with accumulations of morbid secretions, excretions, and fæcal matters, as when spasms occur in colic, or in the course of gout, rheumatism, hysteria, hypochondriasis, &c In these, as well as in some cases of other diseases, not only are morbid excretions thus liable to accumulate, but the blood becomes more or less contaminated by effete materials, which the impaired functions of the emunctories fail of removing. In these circumstances, purgatives should be selected, with the view not merely of evacuating the contents of the bowels, but also of promoting the functions of excreting organs. When cerebral congestion is connected with spasms, then active derivative purgatives ought to be exhibited by the mouth and in enemata, and with this view, as well as with the intention of removing spasms by one of the most powerful antispasmodics that can be prescribed, a full dose of spirit of turpentine should be given with castor oil, or with other purgatives, and administered in an enema. When the liver is congested or torpid, as may in many cases be ascertained by percussion, then calomel with camphor, and various other chologogue purgatives, will be most appropriate.

32. *B.* When the spasm is contingent upon *inflammatory action*, recourse to vascular depletions, general or local, is commonly required; and what has been stated above (§ 29) respecting blood-letting is also here applicable to a great extent. It should always be recollected that inflammations accompanied with spasm or convulsion rarely admit of vascular depletions to the same amount as will be safely and advantageously borne in pure, uncomplicated inflammation. Indeed the depletions may even increase the spasm without materially diminishing inflammation,

* [We doubt much the propriety of administering lobelia emetics in any cases where "the vital or nervous power is much reduced." Such a condition powerfully predisposes to spasm, and it is very likely to be aggravated by such a powerful acrid as lobelia. A simple emetic of ipecacuanha, or, if sedation is indicated, combined with a small quantity of antimony, will be preferable. We have known violent spasms produced by lobelia emetics in Thomsonian practice.]

when injudicously employed, or when confided in chiefly, and when the inflammation is of an asthenic character. In this latter state more especially, and in other circumstances of this morbid alliance, deobstruent purgatives, conjoined with stimulants and antispasmodics, are required; and even in cases where vascular depletions are most indicated, not merely such purgatives, but also stimulating antispasmodics, may be most beneficial, with other restoratives which the peculiarities of the case will suggest. In some instances an emetic, judiciously selected and combined, will also be of much service, after depletion has been resorted to, when clearly indicated. In the worst form of spasm, as in that contingent upon asthenic or cachectic inflammation, for which bloodletting is generally more injurious than beneficial, the early exhibition of an emetic, followed by purgatives, and by tonics conjoined with alkalies, antispasmodics, counterirritants, &c., will be found more certainly useful than other means.

33. Spasms of the voluntary muscles, either limited or more or less extended, are often produced by inflammation at or near the origins of the nerves supplying the affected muscles, or by inflammatory action, or irritation of the membranes in the vicinity, or by disease of the adjacent bones, as shown when treating of lesions of the *brain*, *spinal cord*, and *membranes*, or of the *cranium* or *spinal column*; and for these, although general or topical bleeding may be requisite, according to the nature and features of the case, purgatives, alteratives, derivatives, counterirritants, sedatives, and the other means fully set forth in these articles, are especially required.

34. *C.* The dependence of spasm on *acrid, morbid, or other irritants in the digestive canal* is of frequent occurrence, both primarily and unconnected with any special malady, or so associated, as in gout, hysteria, &c. In all these circumstances, emetics, purgatives, anthelmintics, &c., as above recommended (§ 30, *et seq.*), are indispensable. In the gouty and rheumatic diathesis, equal parts of magnesia and sulphur, taken on several occasions, and followed by a more active cathartic, will be found efficacious; and if there be reason to infer the presence of worms, the spirit of turpentine with castor oil, or anthelmintics, purgatives, &c., will be generally indicated; but they should be afterward followed by chalybeates, tonics, and antispasmodics, as recommended in the article on Worms.

35. Irritation of the higher portions of the alimentary canal by the irruption of acrid bile into the duodenum often occasions spasms of the abdominal muscles and calves of the legs, but these generally subside after the evacuation of the morbid matters; dilution of the acrid secretions by warm, emollient fluids, narcotics subsequently, and mild purgatives afterward, effecting a complete cure, generally in a short period. (*See* Cholera, &c.)

36. *D.* Spasm is not frequently occasioned *by contamination of the circulating fluids*, unless at a far advanced period of febrile and pestilential diseases, as in pestilential cholera, and when the functions of the kidneys are impaired, interrupted, or otherwise disordered. In these circumstances vital power requires support, while morbid matters are evacuated and the actions of the depurating organs are excited by their appropriate stimuli. We should, moreover, endeavour to change or counteract the influence of those materials which thus accumulate in the blood—to remove or neutralize them. They can be removed only by increasing the functions of the emunctories, and they may be neutralized by appropriate alkaline or mineral agents, and by antiseptic and antispasmodic medicines, as recommended when treating of the maladies in which spasms are most frequently observed.

37. *E. Structural lesions, injuries, &c.*, of the bones, or membranes near the origins, or in the course of, the nerves supplying the extremities or voluntary muscles not infrequently occasion spasm of these muscles, and require the means already recommended (§ 29, *et seq.*), modified according to the nature of the lesion or injury, and to the peculiarities of the case in other respects. In these states of disease the performance of the several excreting functions requires especial attention, and the evacuations a particular examination.

38. *F. Extreme exhaustion of vital or nervous power*, causing spasm or irregular or convulsive actions of voluntary muscles, or of involuntary parts, is often irremediable, especially when it appears at an advanced stage of pestilential or febrile maladies, or after large losses of blood, and in the course of exhausting or contaminating diseases. In these circumstances, powerful stimulants and antispasmodics—wine, opium, camphor, ammonia, oxyde of bismuth, ammoniated copper, cajuput oil, phosphoric acid, the preparations of sumbul, arnica montana, the ethers, brandy, &c.—are necessary, and one or more of these may be conjoined with such preparations of iron, or of asafœtida, or of valerian, of zinc, of silver, of phosphorus, cannabis Indica, or of musk, castor, &c., as the peculiarities of the case will suggest.

39. *G.* When spasm or cramp is caused *by excessive action of the affected muscles*, or by contraction of muscles without a due determination of volition, it generally soon ceases, and requires merely frictions and quiet. If it recur, friction with stimulant liniments, the application of warm embrocations near the origins of the nerves or portion of the spine enclosing these origins; frictions with chloroform or ether, or with turpentine and camphor, either over the affected muscles or along the spine; and subsequently the cold douche or affusion, or sponging the spine night and morning with a tepid or cold solution of bay-salt, followed by gentle friction with the hair glove, &c., will generally prevent a recurrence of the spasm.

40. *H. Punctures or injuries of tendons, &c.*, are occasionally followed by trismus or tetanus, the most continued and dangerous form of spasm, and one which requires, more than almost any other disease, the most energetic stimulants, antispasmodics, and tonics; the powerful doses of sedative and narcotic substances generally resorted to for this affection tending rather to hasten than to avert dissolution. (See *arts.* Tetanus and Trismus.)

41. *I.* The *influence of the sexual organs* in producing spasm or convulsion is especially manifested by the female. But there are often other morbid conditions present besides either irritation, congestion, or inflammatory excitement, or vascular determination of these organs. Generally nervous power, especially organic nervous power, is disordered or depressed, the secretions disordered, and the excretions insufficient or retained; consequently, assimilation is impaired, and the

blood poor. The affection of the sexual organs is readily induced by mental emotion or desire; and this affection reacts upon the brain and nervous system generally, is propagated by the ganglial system to both the abdominal and thoracic viscera, disordering the functions of the urinary organs, occasioning spasmodic actions of the alimentary canal, respiratory organs and passages, and often exciting spasms or convulsions, or both, by the extension of the irritation to the roots of the spinal nerves, and even to the spinal marrow, medulla oblongata, and brain.

42. The treatment hitherto recommended in these cases has consisted chiefly of stimulants and antispasmodics, and have been but insufficiently directed to the sexual organs and to the mind. The morbid or irritated state of these organs should be removed, and sexual desires suppressed. Instead of stimulants and heating anti-spasmodics, cooling medicines, as nitre, small doses of camphor, magnesia, alkalies, &c., should be given in bitter infusions, and the mind ought to be occupied agreeably and profitably. When spasmodic affections occur in females or males, especially if the countenance become pallid or sallow, then the most noxious vice of all vices should be suspected, namely self-pollution (see *arts.* Debility and Pollution); and unless this be relinquished, and the mind be healthily and morally regulated, medical treatment will be of no avail. (See *arts.* Chorea, Colic, Convulsions, Epilepsy, and Hysteria.)

Biblioo. and Refer.—*Hippocrates*, Περι των εν κεφαλη τραυματων, Opera, p. 906.—*Avicenna*, Canon., l. iii., fen. ii., tr. i., cap. 1, 18.—*Bokel*, Dissert. de Spasmis. Helmst., 1587.—*Schenk*, Observat., l. i., no. 242.—*J. R. Saltzmann*, De Spasmo seu Convulsione, &c., 4to. Argent., 1620.—*G. Rolfink*, De Spasmo, &c., 4to. Jenæ, 1631.—*S. Schultz*, De Motu quodum totius corporis, horrendo et diuturno, &c., in Miscell. Acad. Nat. Curios., Dec. i., Ann. vi., p. 209.—*T. Willis*, Patholog. Cerebri, et Nervosi generis Specimen, in quo agitur de Morbis Convulsivis, &c., 12mo. 1670.—*L. Heister*, Dissectio Mulieris miris Spasmis brevi defunctæ, in Ephemer. Nat. Curios., cent. v. et vi., p. 166.—*J. M. Mueller*, in Ibid., cent. ix. et x., p. 373.—*Amatus Lusitanus*, cent. ii., cas. 9, 10.—*C. A. Bergen et Muller*, De Morbo Epidemico Spasmodico-Convulsivo Contagii Experte.—*Halleris*, Disput. ad Morb., vol. i., p. 75.—*Waldschmidt et Schaffer*, De Morbo Epid. Convuls., &c., in Ibid., vol. vii., p. 518.—*Cartheuser*, De Spasmis in Genere. Fr., 1764; et de Variis Spasmorum Causis et Remediis. Fr., 1753.—*Bonet*, Sepulchr., l. i., sect. 13, obs. 19, 28.—*Juncker*, De Morb. Spasmodico-Convulsivis, &c. Hal., 1739; et De Spasmis eorumque Quadruplici respectu. Hal., 1754.—*F. Hoffmann*, Dissert. Compend. et Clinica Morbor. Spasmodico-Convulsivorum praxis, &c., Opera, Suppl. ii., p. 201.—*De Haen*, Rat. Medendi, &c., t. vi., p. 158. (*Continuance of the rigidity of spasm after death.*)—*M. Stoll*, Rat. Med., &c., t. v., p. 112.—*G. Baker*, in Med. Transact. of Coll. of Phys., vol. i., art. 19.—*Lentin*, Beytrage, p. 181.—*R. Whytt*, Works, 4to, ed. 1768, p. 489–712.—*J. S. Kaehler*, Morbi Spasmodici aliquot Historiæ, 8vo. Serov., 1778.—*Say*, in Mem. of Med. Soc. of Lond., vol. iii., art. 30.—*Pole*, in Ibid., vol. ii.—*Autenrieth*, Physiologie, § 735.—*J. Kock*, De Convuls. Invenem decussatim distorquentibus, 4to. Argent., 1779.—*Wilkinson*, in Med. Facts and Observat., vol. iii., no. 8.—*E. Home*, in Philosoph. Trans. for 1801, par. i.—*Marcus*, Magazin für Therap. u. Klinik., b. i., p. 324.—*J. Frank*, Praxeos Medicæ Univers. Præcepta, sect. ii., vol. ii., pars ii., p. 558.—*J. C. Prichard*, A Treatise on Dis. of Nervous System: Pt. i., Convulsive and Maniacal Affect., 8vo. Lond., 1822. Reviewed in Lond. Med. Repos., vol. xvii.—*R. Powell*, Three Cases of Convulsive Affection, 8vo. Lond., 1815.—*Villermay*, Traité des Maladies Nerveuses propriement dites, 8vo. Paris, 1817.—*Pinel et Brichseau*, in Dict. des Sciences Médicales, t. iii., p. 251.—*J. Mitchell*, in Transactions of Roy. Medical and Chirurg. Society, vol. iv., p. 25.—*B. Travers*, in Ibid., vol. xvii., p. 361.—*B. C. Brodie*, Ibid., vol. xx., p. 132.—*R. Bright*, in Ibid., vol. xxii., p. i.—*R. Wade*, in Ibid., vol. xxxii., p. 65.—*Ackerly*, British and For. Med. Review, Jan., 1838, p. 273.—*J. Wilson*, in Medico-Chirurg. Review, vol. xxix., p. 377.—*M. Good*, Study of Medicine, ed. by *S. Cooper*, vol. iii., p. 225.—*J. A. Wilson*, On Spasm, Languor, Palsy, &c., of the Muscular System, 8vo. Lond., 1843.—*M. Hall*, On the Threatenings of Apoplexy and Paralysis; Spinal Syncope; Hidden Seizures, &c., 8vo. Lond., 1851. (See also the Bibliography and References to the Articles Chorea, Colic, Convulsions, Epilepsy, Hysteria, &c.)

[Am. Bib. and Ref.—*Eberle, Dewees, J. Bell, Wood, Hosack*, and *S. H. Dickson's* Systems of Practice. Also, *Eberle, Dewees, Stewart, Condie*, and *Meigs*, On Diseases of Children.]

SPINAL COLUMN, DISEASES OF.—Synon.—*Vertebral column; Columna vertebralis; C. spinalis*, Auct. Var. · *L'épine du dos, Rachis*, Fr. *Der Rückgrat*, Germ. *The Spine, Spinal Cord, and Membranes.*

1. I. Preliminary Remarks.—The spinal column has attracted to itself a due proportion of attention from medical writers only in comparatively recent times. The diseases of the several tissues, of which this column and its contents consists, were either altogether unknown, or overlooked, or if partially known, undeservedly disregarded, until J. P. Frank, in 1791, published his celebrated treatise on the great importance of this part of the frame in disease. Previously to this period, disorders and lesions of the spinal column and cord received only partial and very imperfect notices from medical and surgical writers. Some mention of the functions and diseases of these parts is to be found in the works of Hippocrates, Galen, Aretæus, and Celsus; but the structure and functions displayed by them, more especially by the spinal cord, were very imperfectly investigated and understood, until Bartholin and Blasius entered upon this undertaking. Vieussens afterward, Huber subsequently, and Monro, Frotscher, Ludwig, Gall, and Home at later periods, cultivated still farther this field of research. Injuries and diseases of the vertebral column were treated of by Pott, Paletta, Soemmering, C. Bell, A. Louis, and others; while the maladies implicating chiefly the spinal cord and its membranes were illustrated successively by Vogel, Portal, Bergamaschi, Brera, Autenrieth, Mussy, Schmalz, Racchetti, Choulant, Ollivier, Brodie, the author, and others; but it was not until the researches of C. Bell, Magendie, M. Hall, Valentin, Stilling, Van Deen, Budge, &c., had thrown additional light upon the structure and functions of the cord, that the diseases of this organ and of its envelops have been duly illustrated. Even at the present time, it is doubtful whether or not these diseases have received the full amount of investigation which they have so long required. The reader will find, in the sequel, an account of the works furnished not only by writers now enumerated, but also by many others, who have contributed more or less to the present advanced state of our knowledge of diseases of the spinal column, and of the very important tissues which this admirable structure contains and protects.

2. *A.* It may not be disadvantageous to take *a brief survey of various topics connected with the pathology of the spinal column, and of the parts which it contains, especially in relation to certain agencies, and to other maladies, with which affections of these structures are often more or less intimately associated.*

3. *a.* During the several forms and stages of *fever*, periodic, continued, exanthematous, and malignant, the functions of the spinal cord are more or less impaired or disturbed, as evinced by the pains in the back, loins, and limbs, and by incapability of assuming the erect posture, or even of

moving. In the early stages of these maladies, these symptoms are manifestly due chiefly to congestion of the veins and venous sinuses of the vertebral canal, and to disordered circulation in the cord and its membranes; but at more advanced stages, the morbid or contaminated state of the blood itself, and the failure of vital power generally, still farther increase the deficiency of voluntary motive power, paralyzing not only the limbs, but affecting more or less, through the medium of the branches of spinal nerves communicating with the ganglial and visceral nerves, the functions of the several internal organs, and especially of the urinary and genital.

4. *b. Rheumatism* and *gout*, the former especially, may attack, by metastasis or otherwise, the membranes of the spinal cord, and by the effusion of lymph between them greatly impair or entirely abolish either motion or sensation, or both, in parts supplied with nerves from or below the seat of effusion. A similar succession of disease may occur in the course of various acute eruptive maladies, although much more rarely.

5. *c. Scrofula*, *tubercles*, and *rickets* very frequently attack the spinal column, generally the bodies of the vertebræ, and produce the most serious effects not only upon these, but not infrequently also upon the membranes, the spinal cord itself, and the roots of the spinal nerves, causing the several sympathetic disorders which will be described in the sequel. The affection of the spine may, in scrofulous subjects, be the only serious manifestation of the scrofulous taint, or it may be associated with, or consecutive upon, other outbreaks of this taint, in the form of tubercular infiltration or other structural lesions.

6. *d.* The affection of the spinal cord and membranes may be connected with *disorder of the sexual and urinary organs*; and, although the more severe affections of the former generally disturb or abolish the functions of the latter, serious or protracted disorders of the urinary and sexual organs not infrequently excite important lesions of the spinal cord. This latter procession of morbid phenomena admits of ready explanation. Exhausting seminal and other discharges from the genitals depress vital power generally, impair the requisite nutrition and regeneration of the nervous influence of the cord; and thereby not merely weaken remarkably the functions of this organ, but affect its intimate organization, favouring softening or other structural change. Irritation also of the sexual organs, and of the urinary organs also, may be propagated by the communicating branches of nerves to the spinal cord, and, when thus extended and perpetuated by a continuance of the cause of irritation, serious lesions may be reasonably inferred to arise not only in the cord itself, but also in its several envelopes, and even in the blood-vessels lodged between these envelopes and the bodies of the vertebræ.

7. *e. Inflammatory affections of the nerves*, especially of those of the lower limbs, may extend even to the spinal cord or membranes, and produce in these similar changes to those which follow the metastasis of rheumatism or gout to these structures, or the suppression of eruptions, &c. This succession or extension of disease is rare; but a few instances have come under my observation, especially the extension of inflammatory sciatica to the sacrum and back, and the supervention of spasms, followed by loss of motion, &c.

8. *B. There are various symptoms, circumstances, and complaints, several of them appearing obscure or anomalous, which ought to direct our attention to the spinal column, and lead to a very careful examination of its state and functions.*—*a.* The *voice* and *respiration* are often affected when the upper portion of the medulla or cord is in any way implicated in disease. I saw some years ago a gentleman who had been seized when a young man with hemiplegia, the speech, tongue, and muscles of the face having been affected. He was subsequently quite restored to health, and presented no indication of paralytic affection, and had for many years pursued his profession. But on the last occasion of his consulting me he complained of a form of hoarseness, or state of voice which had been treated by more than one physician as a chronic laryngitis. I had arrived at first at the same conclusion; but an examination of the chest, throat, and neck, attention to his articulation and voice, and the previous history of the case, convinced me that the affection was more paralytic than inflammatory, and that he was in imminent danger of an attack of asphyxia, of apoplexy, or general paralysis, from lesions about the medulla or base of the brain. The treatment was directed accordingly; a seton was placed in the nape, but he died suddenly some time afterward. The affection of the functions of respiration, and even of the actions of the diaphragm consequent upon disease of the medulla or of its envelopes, was known to Galen.

9. *b.* Since the days of Galen (*De Locis affectis*, l. iii., c. 10), the influence of the medulla oblongata and spinal cord upon respiration and the actions of the *heart* was overlooked until Vernay, Morgagni, Eller, Zinn, Le Gallois, Prochaska, Brodie, and, more recently, W. Phillip, C. Bell, and M. Hall, directed especial attention to the subject. The last-named writers, however, imputed the action of the heart entirely or almost wholly to the nervous influence of the medulla, overlooked the more important influence of the organic or ganglial nerves abundantly supplied to the heart and respiratory organs, and directed their attention chiefly to, and overestimated, the spinal nervous influence, which only re-enforces and modifies the more important and greater—the more vital—power which the heart and lungs receive from the other source just named. There is no doubt that the mechanism of respiration—the respiratory muscles, are more especially influenced and actuated by the medulla and cord; and that whatever interrupts or intercepts the nervous influence from these sources, or from the more basilar and central parts of the brain, by causing asphyxia, soon arrests the actions of the heart. That the contractions of the heart may be rendered more energetic, more tumultuous or impulsive, either by mental emotion, or by irritation of the sources of nervous influence now named; or, on the other hand, that these contractions may become more slow, more weak, and even more irregular and intermittent, until death may supervene with more or less rapidity, owing to a defective, or an interrupted, or an intercepted transmission of nervous influence from these sources, cannot be disputed. In cases, therefore, which present disordered action of the heart, of whatever kind, not only should this organ itself be carefully examined, but also the state of the spine, as far as that may be done, and the several manifestations of organic nervous influence, as

displayed by the several digestive, assimilating, and excreting functions.

10. *c.* The abdominal muscles are subject not merely to *cramps* and *spasms* when the medulla spinalis or its membranes are diseased, but, even independently of cramps, the patient often complains of a remarkable increase of the sensibility of the cutaneous surface, of a sensation of girding or *constriction* around the abdomen or base of the thorax, subsequently of impaired sensation and motion, with great constipation of the bowels, retention of urine, and various other symptoms, according to the portion of the cord which is implicated. (See *art.* Paralysis.)

11. *d.* The limbs are often the subjects of *cramps*, or permanent *contractions*, often with an intervening sensation of *prickings*, numbness, and peculiar modifications of sensibility, especially near the points of the toes or fingers, with a sense of weight and numbness of the legs and feet, or of the whole limb. Occasionally these sensations are felt on one side only, or in both, or more severely in one than in the other; and, although they often precede an attack of gout, they frequently are precursors of organic lesions of the cord or its membranes, and thus usher in an attack of paraplegia, or inflammation of the cord and its membranes, or accompany inflammation of the intervertebral cartilages, or caries of the bodies of the vertebræ.

12. *e.* More or less *severe pain* or *neuralgia* may be complained of in some remote part from the spine, or in one or more limbs, often in the extremities, but as frequently deep-seated in the middle of the thighs, or in the abdominal muscles, or between the ribs, the pain often admitting of being traced to the origin of the affected nerve in the spine. The effect of position upon the pains—of standing, or sitting, or lying down in the prone or supine position; and the periods of the day or night when they are most acute, ought to be carefully ascertained. In cases of inflammation of the cord, or of its membranes, or of the bodies of the vertebræ, the pain is much increased towards morning and after lying upon the back, and extends around the abdomen and down the limbs, with at first retention of urine, constipation, and subsequently loss of power of the sphincters. If, however, the inflammation be slight, and the patient has not retained the supine posture during the night, the pain may be diminished in the morning, owing to augmented capacity, by elongation, of the spinal canal.

13. *f.* The state of the *sexual functions* are often much disordered in diseases or injuries of the spine or of the cord. While masturbation, or sexual intercourse, when excessive, may impair the nutrition of the cord, and induce disease both of it and its membranes, the latter occasions, particularly when the lesion is low in the cord, loss of sexual power, and incontinence of urine. Injuries or acute disease in the cervical portion of the cord are often attended by priapism.

14. *g.* The above and other phenomena, which will attract the attention of the observing physician, will always suggest to him the necessity of having recourse to a careful examination of the spine; and even when none of the above is present, the patient, however, presenting unusual debility, or impairment of activity or motion in the lower extremities, or great weakness or trembling of the knees, with a bent, staggering, or unsteady mode of progression, emaciation of the lower extremities, relaxation of the ligaments of the joints, &c., the experienced observer will infer impaired nutrition and function of the spinal cord, either from the exhaustion produced by masturbation or excessive sexual indulgence, or from congestion of the venous sinuses of the vertebral canal, or from incipient softening or other structural change in the cord, or in its membranes.

15. *h.* *An examination of the spinal cord* should be connected with a careful inspection of it in various positions—while standing erect, while the trunk is bent to either side, and when the patient is prone. The effect of bending or turning quickly to either side should be observed; for, even in incipient caries of one or more bodies of the vertebræ, the patient sometimes experiences a sensation, grating, or crepitation, on making any of those changes of position. The sensibility of the surface of the trunk and limbs, the temperature and state of the skin, and the degree of rapidity with which volition is conveyed to the extremities ought to be noted. The clavicles, the ribs, the sacrum, the crests of the ilia and hips, should also be noticed, in respect of their particular states, and of their relations to the spine; for by their aid, relative position and direction, incipient states of curvature may be ascertained. The effects of pressure and of percussion over the spinous process of each vertebra, and over the outlets of the spinal nerves, should be carefully observed. It has been supposed that the pressure of a hot sponge directed over the vertebræ will detect subjacent lesion, and point to its exact seat when other modes of having recourse to pressure will fail. I have not observed much advantage from this mode of examination, but it need not be neglected; inasmuch as the more fussy and the more particular, and the more singular the mode and means of examination resorted to, even when the nature of the case is as clear as sunshine, the more they will attract the observers, both interested and disinterested, and accord with the prevailing ad captandum minuteness and professional manipulations of the day. If there be no occasion for a graceful display of the stethoscope—and when may not such be necessary, or made apparently requisite?—and if there be no requirement for the introduction of the speculum—and when, indeed, should the phalloid instrument be neglected, if the patient be a female?—let us by all means have recourse to some other medium of communication between the patient and doctor—some new instrument of legitimate medical charlatanry—that may strike, if not amuse or gratify, the former, and recommend the latter. How is it that, amid the remarkable number of spine doctors and writers on spinal curvatures for the benefit of a discerning public, no one has invented a pocket instrument for examining and straightening the spine? Or, has one been actually invented, but, having been always applied *à posteriore*, no one besides the inventor and manipulator has yet been able to detect the excellence or penetrate the mysteries of the invention?

16. II. The Causes of Diseases of the Spinal Column, Membranes, and Cord, are generally sufficiently manifest; but they are occasionally more or less obscure, especially as regards the extent of their individual influences. As the causes of disease of the several structures

composing the spine are almost common to each variety or form of malady to which these structures are liable, although certain of the causes affect one tissue in preference to the others, I shall, therefore, devote a due consideration to all of them, with such notices of their effects as may best subserve practical purposes.

17. *A. Improper physical education and clothing* comprise a great variety of circumstances and causes productive of curvatures, and even of more acute diseases of the spinal column; and, although this class of causes operate chiefly in childhood and early life, yet their effects often continue until old age, and are rendered more severe and irremediable by the regimen and clothing adopted during puberty and adult age. In this climate more especially, the frequent and sudden vicissitudes of temperature and humidity require that the body—both trunk and extremities—should be covered in such a manner as to preserve the surface in a sufficiently warm and perspirable state, avoiding any excess or extreme of cold or warmth, and to allow a free and easy exercise of all the muscles of the extremities and trunk. Thus clothed, and avoiding all cinctures or corsets, or other baneful contrivances introduced by ignorant dogmatizers, from the period of infancy upward; exercise in the open air and in sunshine; sufficient but not immoderate or improper food, are the means which will best ward off affections of the spine, and in proportion as either of these is neglected, so will a predisposition to these affections be generated.

18. The use of stays or corsets of any kind during childhood, and exposure of the joints to cold, are among the greatest evils to which the human race is liable. The former embarrasses and limits the actions of the dorsal and lumbar muscles, and of all the muscles of the trunk, weakens and relaxes the vertebral ligaments, and while it favours unnatural curvatures, endangers more or less the important parts lodged in the vertebral canal: the latter weakens and enlarges the joints, and depresses vital power. The want of due air and proper exercise from the age of five years to twenty; the mental cramming pursued during the greater part of that time; the prolonged periods of study in a crowded and insufficiently ventilated apartment; sleeping in a self-contaminated air, and in chambers over-crowded or too small for the number of occupants; insufficient, or unwholesome, or incongruous food are very generally associated causes of the delicacy of constitution, of the weak or imperfect development of muscle, and of the relaxation of ligaments, which both predispose to, and even directly occasion, spinal curvatures and disease. The vice of self-pollution, moreover, which is apt to spring up and diffuse itself in young persons about the age of puberty, when they live in considerable numbers under one roof, remarkably aids these causes in developing their effects upon the nervous system and spinal column; but to this most important agency more particular attention will be paid in the sequel.

19. In connexion with the use of stays, the usual mode of their construction requires some notice. While they are so made as to press downward and together the lower ribs, to reduce the cavity of the chest, especially at its base, to press injuriously upon the heart, lungs, liver, stomach, and colon, and even partially to displace these vital organs, they leave the upper regions of the chest exposed—those very regions where tubercular, consumptive, bronchial, and inflammatory diseases generally commence, or are the most prone to attack—to the vicissitudes of season, weather, temperature, humidity, and external injury. These noxious and unnecessary articles of clothing—these mischievous appliances to the female form, useful only to conceal defects and make up deficiencies in appearance, are rendered still more injurious by the number of unyielding, or only partially yielding, supports with which they are constructed on every side. There are the whalebones in the back and sides, and the steel in front, extending from nearly the top of the strenum almost to the pubes. The motions of the trunk and spine are thereby restrained, and the nutrition of the compressed parts impaired; but, irrespective of the displacement of vital and assimilative viscera that follows the amount of pressure, the metal support in front has an injurious effect, which has been universally overlooked. However well it may be protected from contact with the surface, it acts as a conductor both of animal warmth, and of the electro-motive agency passing through the frame: it carries off by its polarization, into the surrounding air, especially during humid states of the atmosphere, the electricity of the body, this agent being necessary to the due discharge of the nervous functions, either in its electro-galvanic or magneto-electric state or manifestation. The injurious influence of stays on the female economy, as respects not only the diseases of the spinal column, but also the disorders of the uterine organs, is manifest to all who consider the subject, and has been ably discussed in a work by Mr. Whitfeld of Ashford, to which I refer the reader.

20. *B. Constitutional vice and diathesis* especially favour the occurrence of, and even directly occasion, diseases of the spinal column. Of these the most influential are the scrofulous, the rheumatic, and the cancerous. Scrofula, either latent or developed—whether concealed or tuberculous—often produces disease of the bodies of the vertebræ, either in the form of scrofulous inflammation of them, or by infiltrating their cancellated structure with tubercular matter. The *causes of scrofula*, fully discussed in another place (see *art.* Scrofula, § 13, *et seq.*), have in many instances the effect of developing disease of the spine without having previously changed the diathesis or habit of body, at least in an obvious manner. In such cases they are often only predisponents to such disease, some other agencies exciting it. While scrofula chiefly causes disease of the vertebræ, the rheumatic diathesis, or pre-existing rheumatism, favours the occurrence of rheumatic inflammation of the ligaments of the spine, or rather of the sheath and membranes of the cord. Inflammation of these tissues may appear either as a metastasis of the rheumatic attack, or primarily upon exposure to cold or wet, or to currents of cold air in this quarter. The gouty diathesis is not so frequently a cause of spinal affections as rheumatism; but congestion of the venous sinuses of the spinal canal, causing pain in the back and loins, and feebleness of the lower extremities, is a frequent complaint in gouty persons. The cancerous diathesis has probably little influence in the production of spinal complaints, although the several varieties of cancerous disease have been occasionally found to implicate one or more of the spinal structures. Children, whose par-

ents are aged or debilitated, and whose conformation is originally weak; the progeny also of the dissipated, the drunken, or the exhausted by syphilis, mercurial courses, or cachectic affections; a rapid or premature growth, and children brought up by hand, or living in large towns without the advantage of occasional change of air; are much more liable to spinal affections than others differently circumstanced, as they advance in growth or age.

21. *C. Certain previous maladies*, especially those above mentioned, exanthematous and malignant fevers, more particularly scarlet fever, the syphilitic cachexy, tuberculous disease, sexual and urinary affections, particularly in the female, aneurisms of the aorta, and internal tumours and abscesses, either favour the development, or excite disease of the spine or of its contents. Aneurisms of the aorta, and internal tumours and abscesses in some instances, by their size and pressure, occasion erosion or ulceration of the bodies of the vertebræ. Flexures of the spine and disease of the vertebræ frequently follow the more severe attacks of the exanthemata; and tuberculous disease with caries of the vertebræ, sometimes followed by abscess, is frequent not only in the scrofulous diathesis, but after tuberculous affections have been developed in the lungs, mesenteric glands, or in other parts.

22. Uterine irritation and excitement, and the several forms of hysteria, and their numerous manifestations and alliances, are often followed by congestion of the venous sinuses of the vertebral canal; by what has usually been called spinal irritation, or inflammatory congestion or irritation of the cord and its membranes; and by flexures of the spine or structural change of the contents of the column. Frequent sexual excitement and consequent exhaustion, alternating with unnatural rapidity, are the most frequent causes not only of these uterine and hysterical disorders, but also of the allied affections of the spine and its contents; and, although the one class of disorders is generally consecutive of the other, the spinal diseases with their several sympathies more commonly following the sexual, the former may be primarily manifested, especially in the male sex; masturbation about the period of puberty, and premature or excessive sexual indulgences, being the most common causes of chronic disease, the most injurious of vices, mentally and physically, and, while they most powerfully predispose to, they directly occasion, especially in weak constitutions, and when aided by other causes, one or other of the more serious maladies of the spine and its contents. (*See art.* Pollution.)

23. *D. The influence of physical agents*, especially of cold, currents of cold air, unusual increase of temperature, more particularly if these be applied to the back; sleeping in damp beds, or upon the ground, or in the open air, with exposure of the back; sitting in wet or damp clothes; exposure of the back or loins to much heat, especially during dinner; sudden suppression of the perspiration by exposure to cold or to cold air, as when a person is called out of a warm bed. A medical man was called out of bed when perspiring freely, and got into an open carriage insufficiently protected, during a cold night. He was soon afterward seized with inflammation of the membranes of the spinal cord. I attended him with other physicians. A corpulent female of middle age slept with her back to a window which had been left partially open. She complained of chills, pains, and rigours during two or three following days, subsequently of acute pain in the loins, pain, numbness, and cramps in the lower extremities, and other symptoms of inflammation of the spinal membranes. She afterward became paraplegic. A gentleman from Jamaica, after a hot day, fell asleep at night on the deck of the ship in which he was making his passage to Europe. He awakened cold, shivering, and benumbed, and was soon afterward generally paralyzed. A gentleman dined at a party where he was a stranger, and did not complain of the heat of the fire at his back. The following day and the next he had frequent vomitings, violent pain in the back and loins, numbness, pain, and cramps in the legs, obstinate constipation and retention of urine, followed by paraplegia. I could adduce numerous instances similar to the above which have occurred to me during a practice of upward of thirty years. The causes which I have mentioned under this head, as well as those which follow the next to them, generally affect primarily or chiefly the membranes of the spinal cord, the affection of these and its consequences generally implicating more or less the cord itself, and the origins or roots of the spinal nerves.

24. *E. The metastasis and suppression of external disease or accustomed discharges* have been partially noticed above. During an early period of my practice, I observed several cases of this occurrence, chiefly at the institutions to which I was physician. In one case of metastasis of rheumatism to the spinal membranes, which I treated in 1820, general palsy supervened, and I had an opportunity of minutely examining the spine and its contents after death (*see Lond. Med. Repos.*, vol. xv.). Since that period similar cases have come under my observation, which have terminated either in paraplegia, or in general palsy and death. Suppression of the catamenia, the stoppage of profuse leucorrhœa and of hæmorrhoids, the drying up of accustomed discharges, the healing of chronic ulcers and cutaneous eruptions, have severally been followed by disease of the spinal contents. In many of such cases the blood has been more or less impure—has been insufficiently depurated by the several emunctories; and when the manifestations of this morbid condition have been suppressed in quarters which served as safety-valves from more dangerous consequences, they have broken out in other surfaces and parts, and been followed by much more serious results; and although the spinal membranes and cord may not be frequently thus consecutively assailed, yet they are occasionally, when the suppression of the primary disease has taken place before the blood has undergone depuration by an increased action of the excreting organs. We frequently observe surgeons endeavouring to cure eruptions, ulcers, chronic discharges, &c., by lotions, ointments, cerates, and other appliances, either unsuccessfully or with the contingent result of consecutive internal disease when they succeed; whereas, a decided action on the several excreting organs, by appropriate means, by removing effete or injurious elements and materials from the blood—by counteracting or eliminating those irritating and self-contaminating matters perpetuating or causing the primary disease—would most speedily and effectually remove it, and prevent any subsequent risk from metastasis or other morbid manifestation.

25. *F. External injuries* are among the most common causes of disease of the spine, or of its contents. These injuries may be so slight as to be overlooked or forgotten, their effects being developed slowly and insidiously until they arrive at a pitch which alarms either the patient or his medical attendant. The more severe injuries by which a vertebra is broken, or its intervertebral cartilages torn, or ligaments or muscles ruptured, and the cord or its membranes either more or less injured at the same time, or consecutively affected by inflammation, effusion, &c., readily account for the great extent and danger of the effects produced. But there are slighter injuries, which sometimes slowly, and after a protracted period, occasion no less serious results. A slight fall on the back, as on descending a stair, or a fall backward, when the back, or even the os coccygis, strikes against a hard or sharp substance, is sometimes followed, if due care be not taken, by serious effects—by inflammation of the membranes of the cord, or even of the cord itself, and, if not rationally treated, and even when so treated in faulty constitutions, and if a proper regimen be not adopted, by paraplegia, often passing on to general paralysis, and ultimately terminating in coma and death.

26. Concussions of the spine occasioned by falls, or by leaping from great heights or other modes, are frequently followed by effects usually produced by the most severe injuries of the column, even although no fracture, rupture, or dislocation can be traced. The vertebræ and intervertebral cartilages may nevertheless have sustained some injury, and the minute organization of the cord and the origins of the nerves may have been ruptured or injured so as to escape detection after death upon a superficial inspection. In these cases, the severity of the effects will lead to a due appreciation of the importance of the cause. But a slight effect should not be unheeded; and even the most trivial symptom, apparently to the uninstructed or inexperienced, ought to attract to itself marked attention and care. Several instances have come under my care where the most dangerous and even hopeless consequences have followed the slightest falls and concussion, the more immediate effects having failed to attract the attention or care of the sufferer.

27. Among the less marked causes of disease of the spine or of its contents, although occasionally productive of the most important results, are muscular efforts in lifting heavy bodies, or similar efforts made suddenly or irregularly, and when volition is not duly exerted, or is directed also in a different direction. Rapid movements, torsions or bendings of the spine; undue pressure made upon one side of the vertebral bodies, by unnatural positions retained for a long time; frequent rotations of the column, and reaching to objects too high or too low, are occasionally productive of injurious effects. The most fatal injury may even follow a common or slight effort. A strong muscular man broke the second vertebra of the neck completely across on both sides when pressing his head on the pillow as a fulcrum to enable him to turn in bed, and the nature and extent of the injury were ascertained after death by Professor QUAIN and myself.

28. Curvatures of the spine often result from assuming the same position on frequent occasions —by sleeping on a high pillow on the same side, by improper postures in writing, playing on the harp or guitar, by drawing, by carrying a weight or burden on the same arm, as in nursing, and by always using one hand more than the other. Riding on horseback produces most injurious physical and moral effects on females: it gives the spine a certain degree of twist; and the concussions imparted to the nates, pelvis, and trunk occasions a degree of excitement followed by exhaustion, which, if not amounting, often leads on to self-pollution. To these apparently slight causes, especially to their continuance, the lateral curvatures of the spine, so very frequent in females, are in great measure to be attributed.

29. III. CURVATURES OF THE SPINAL COLUMN —FLEXURES OF THE SPINE — LATERAL CURVATURES OF THE SPINE—*Lateral Deflections of the Vertebral Column—Unnatural Deviations of the Spine — Distortions of the Spine — Functional Curvatures of the Spine.*

30. CLASSIF.—I. CLASS, IV. ORDER (*Author in Preface*).

31. DEFINIT. — *Unnatural curvatures of the vertebral column, occurring from other causes than from structural changes of the bodies of the vertebræ.*

32. Curvatures of the spine, produced otherwise than by caries or anchylosis of the vertebræ, may be divided into three *varieties or forms*, namely, *posterior curvature*, or excurvation, the convexity being directed backward or outward; *anterior curvature*, or incurvation, the convexity being inward or anteriorly; and *lateral curvature*, the convexity being to either side, generally the right, and, when considerable, being either double or complicated. The angular projections occasioned by caries or anchylosis of the bodies of the vertebræ are altogether different in their natures from these curvatures, and fall under a different category of lesions.

33. i. POSTERIOR CURVATURE OF THE SPINE — *Excurvation — Cyphosis* — affects chiefly the dorsal and cervical portions of the spine, and only occasionally extends to the upper lumbar vertebræ. It is often caused in infancy by the common practice of raising the child by the open hands placed under the armpits, whereby the ribs are pressed inward, and the spine and sternum are pushed outward, as described when treating of *deformities of the chest* (see *art.* CHEST, § 2, *et seq.*), where the causes producing it are fully stated. Slighter forms of this curvature occur in young persons and in adults, owing to shortness of sight and the habit of stooping, and holding the head near objects when reading, writing, or working; and in aged persons from diminished thickness and elasticity of the intervertebral cartilages, and in these the curvature extends lower in the spine. When the curvature is considerable, the anterior portion of the ring or body of each vertebra is rendered somewhat thinner or more flattened, especially in the centre of the curvature, and, as a necessary consequence, the transverse processes, and still more so the spinous processes, are more separated. The ligaments are also affected, the posterior being more or less stretched. When the ribs are laterally compressed, so as to diminish the diameter of the chest from right to left, the sternum is pushed outward, assuming a similar position to the dorsal spine. In other cases, the sternum follows the direction of the dorsal vertebræ, the ribs being curved outward, and the diameter of

the thorax being lessened between the spine and sternum. If the excurvation implicate the lumbar vertebræ, the angle formed by this part of the spine with the direction of the sacrum or pelvis is lost, and the brim of the pelvis becomes horizontal, the spine and the direction of the pelvis being in nearly the same axis. In excurvations of the spine, the capacity of the thoracic and abdominal cavities, and the position of the viscera, are more or less affected, the former being diminished, the latter being somewhat changed or embarrassed.

34. ii. ANTERIOR CURVATURE—*Incurvation of the spine—Lordosis.*—This form of spinal curvature is most rare. It is most frequently met with in a slight form in the lumbar vertebræ, and is then merely an exaggerated state of the curvature natural to this part of the spine, and is seen not infrequently in persons who, in early life, have brought their lumbar muscles into very active use. In other circumstances, however, it is occasionally observed giving the abdomen unusual prominence, and, when seated near the pelvis in females, presenting the appearance of pregnancy or of ovarian disease. When this curvature affects the dorsal vertebræ, it occasions marked deformity of the chest: the posterior angles of the ribs pass outward and backward from the spine, and the antero-posterior diameter of the thorax is diminished, unless, indeed, the sternum be also pushed forward, which is rarely the case. When the anterior curvature is seated so low down in the lumbar region as to form an angle with the sacrum, the effect in females during parturition may be serious, as it is frequently connected with a diminished antero-posterior diameter of the brim of the pelvis.

35. This form of curvature may arise from an increased force, or more frequent and developed action, of the dorsal or lumbar extensor muscles, relatively to the vital tone or cohesion of the anterior ligaments of the spine, and to the action of the recti abdominal muscles; and it may be associated with some constitutional taint or disease, as with scrofula, rickets, syphilis, or some cachectic condition, &c. When it is connected with rickets, it is most apt to occur during convalescence from this malady.

36. iii. LATERAL CURVATURE.—*Lateral deflections of the spine—Scoliosis.*—This is by far the most common form of spinal curvature, and generally appears between the ages of 10 and 18, although it may commence either earlier or later. It is most common in the upper and middle classes, and comparatively rare in the lower or harder working orders. Owing to the position of the viscera—to the heart on the left, and the liver on the right, it has been supposed that there is always a tendency to a double lateral curvature of the spine, especially in lymphatic, weakly-constituted, and cachectic persons. There can be no doubt that, whatever influence may be produced by this circumstance, it is really so small as not to deserve consideration. The upper lateral curvature has generally its convexity to the left, is small, and comprises the lower cervical vertebræ, with two or three dorsal vertebræ. The second or middle curvature is the most remarkable, has generally its convexity to the right, and is formed by the dorsal vertebræ. The third or lower curvature has its convexity to the left, and comprises the lumbar, and lowest dorsal vertebræ. The first or upper curvature may be very slight, or altogether wanting, although the second or dorsal is considerable; but in this case this latter extends higher, and the third or lumbar is also considerable. Either the dorsal or lumbar may be the most marked, more frequently the former, which, in some instances, may appear the chief or only one.

37. Lateral curvatures may be very slight, or they may be very great: they are seldom completely lateral, but are commonly conjoined with more or less posterior curvature. It is manifest that, when the deflections of the column are very considerable, the natural rotation of each vertebra on the other must be diminished or limited in the curvatures, and that it must take place chiefly between them, or between those vertebræ which remain the nearest to the natural axis of the trunk. The sides of the bodies of the vertebræ must also experience greater pressure towards the centres of the concavities and diminished pressure at their convexities: hence will result compression of the more yielding tissues and impaired rotation at the more flexed situations. The intervertebral tissues are first compressed in the sides, which are concave, and afterward thinned. The bodies of the vertebræ are also more or less affected, and atrophied in these sides, and assume somewhat of a rhomboidal form. The articulating processes are much altered in the situations where the curvatures are greatest: they are atrophied, nearly obliterated, and absorbed in the concavities, and rendered more prominent, the spinous processes being also more protruded in the convexities.

38. When lateral curvatures are very great, the effects become still more serious. The passages between the vertebræ for the nerves and blood-vessels are straitened and almost obliterated in the concave side, and enlarged and elongated in the convex. The consequences of the constriction of these outlets must be evident in respect of both nerves and blood-vessels. They were pointed out by MORGAGNI and PORTAL, and more recently insisted upon by CHAILLY and DUGÈS. The pressure, also, on the sides of the vertebræ sometimes causes partial absorption or caries of the part which suffers the most from it; and in these situations, or where the concavity is greatest, ossific deposits are there formed, producing partial or lateral anchylosis, sometimes extending to the lateral, transverse, or oblique processes of articulation, and furnishing support to the most affected and weakened part of the spine. In these situations the ossific formation results from a state of chronic inflammation which is productive of this work of reparation.

39. The *consequences* of extreme or even of considerable lateral curvatures are often very serious. The patient is liable to severe pains, cramps, numbness, and impaired action of the muscles supplied by nerves issuing from the concave side of the spine, when the passages for the nerves and blood-vessels are narrowed. Emaciation frequently follows; and owing to the falling inward and approximation of the ribs on the concave side of the curvature, and to the bulging outward of those on the convex side, the cavities of the chest and abdomen are rendered more or less irregular or unsymmetrical, and are also much encroached on; the viscera, especially the lungs and heart, and even the liver, kidneys, and alimentary canal, are embarrassed or impeded in their functions; difficulty of breathing, amount-

ing sometimes to orthopnœa, and palpitation, or slowness, or irregularity of the pulse often occurring, with a feeling of incapability of raising the ribs, or of taking a full inspiration, especially on the concave side. Frequently the viscera accommodate themselves to their unnatural position, when the curvatures increase gradually, and comparatively little inconvenience is experienced unless upon increased exertion; but when these viscera, particularly the heart or lungs, are attacked by disease, to the causes of which their physical and vital conditions render them most susceptible, then the consequences are much more serious than when these organs are attacked in different circumstances.

40. It is very rare for the spinal cord or its membranes to experience much disorder during lateral curvature, unless the bodies of the vertebræ at the place of greatest concavity become inflamed or carious; but when either of these results ensues, chronic inflammations, effusions, and organic changes occasionally supervene, in the parts contained by the diseased vertebræ, and the usual effects, namely, severe pain, spasms, and contractions of the muscles of the trunk and extremities, and loss of motion, with or without loss of sensation, generally take place. The disease of these structures sometimes extends until the greater part of the spinal contents is invaded, and even until inflammatory action reaches the membranes of the brain, and occasions effusion within the cranium, coma, and death.

41. When the deviation is great, deformity is manifest as regards the position of the shoulder-blades, the collar-bones, and the pelvis. The muscles are also affected, those which are the least used becoming pale and atrophied; and the ribs are also more or less distorted, those on the concave side not merely being closely approximated, but, in old and extreme cases, becoming partially anchylosed. The chief curvature implicating the dorsal spine commonly presents its convexity to the right, pushing outward the shoulder-blade, and causing the left shoulder-blade to fall inward. When the chief curvature is in the lumbar region, it is generally directed to the left, and more or less posteriorly, the bodies of the vertebræ being considerably changed (◊ 37), and sometimes becoming even disorganized.

42. *The progress* of spinal curvature is extremely variable. They sometimes proceed slowly and insensibly; occasionally rapidly. They have been said sometimes to occur suddenly and unexpectedly after a first confinement, and increase remarkably. It may be suspected that in such cases the curvature had existed previously, but had been concealed by the dress, the puerperal states and lactation merely augmenting the deformity. Curvatures may proceed to a certain extent, and become stationary ever afterward; or they may, upon the removal of the causes, and by proper means, be in great measure remedied. When neglected, they may be increased so as to bend the patient forward, or to either side, in a most surprising manner, the armpit almost reaching the hip-joint.

43. iv. The PROGNOSIS OF CURVATURES depends chiefly upon their extent, and upon the effect produced upon the spinal contents, upon the spinal nerves, and upon the viscera of the chest and abdomen. The curvature may be very great, and yet, as long as neither spasms, nor paralysis, nor marked embarrassment of the functions of vital or internal organs, nor other serious disorders supervene, reasonable hopes may be entertained of an advanced age being reached. The appearance of such disorder, as a manifest consequence of curvature, should suggest an unfavourable prognosis, the danger having stricter reference to the nature and extent of the consecutive disturbance than to the amount of curvature. The removal of old curvatures is seldom attained with complete success; and, unless with the view of alleviating serious disorder occasioned by them, should not be rashly attempted; for adhesions, adaptations of parts, ossific formations even, and other alterations, may have taken place, that may not be disturbed without occasioning more serious disturbance.

44. v. THE CAUSES which more especially occasion curvatures of the spine are the female sex, the age between 9 and 18; a lymphatic, scrofulous, or rickety constitution; an originally weak conformation of frame; an exhausted, feeble, or cachectic habit of body; insufficient food, living in low, humid, and close situations, and all the causes productive of scrofula; convalescence from acute and chronic maladies; want of pure air, light, and sunshine; a premature and rapid growth; defective or improper exercise; crowded and close apartments during night and day; the continuance of mal-positions; the too exclusive use of the right hand and arm; the use of stays, and metal or other supports, and self-pollution. MAYOW attributed curvatures to a want of harmony between the development of the vertebral column and that of the muscles; and MORGAGNI, MÉRY, and more recently GUÉRIN, believed that they are often caused by contraction of the muscles consequent upon disease of the nervous centres. MAYOW'S hypothesis is incapable of support; the opinion of MORGAGNI is more deserving of attention, and may be admitted to be just in some instances.*

45. vi. THE TREATMENT OF SPINAL CURVATURES, as promulgated to the public in recent times, would, in the hands of a MOLIÈRE, furnish a most bitter satire on medical practice—so many writers, and so much said, and yet so little information furnished—each successive author depreciating the means advised by his predecessors, and yet adding nothing to what was already known—every new spine doctor having his own

[* The whole system of *boarding-school* education in this country is well calculated to predispose to and excite diseases of the spinal column. A large majority of girls who have attended one of these establishments for a few months labour under a greater or less degree of lateral distortion of the spine, a deformity rarely to be met with in boys or girls, unless the victims of fashionable boarding-school education. The efficient causes are: insufficient out-door exercise, too scanty diet, and bad postures of the body and limbs. The vertebral and intervertebral substance on their anterior part are generally compressed by the habit of bending the neck while writing or drawing, thus causing a permanent change in the form of this part of the spinal column. The elevation and action of the right arm in drawing and writing, with sedentary habits, &c., induces lateral curvature of the spine to the right. The convexity of the spine thus produced keeps the right shoulder elevated, and the left depressed. The lower part of the column is thrown to the left side, and this displacement being favoured by the disposition to rest on the left foot while standing to speak or read, there comes to be a permanent projection of the left hip. The frequent use of the harp, from the constant extension of the right arm, is known to produce the same distortions. The whole system of fashionable education is an outrage upon nature, and a most prolific source of unnumbered evils to the race. If it cannot be reformed, it should be abandoned.]

apparatus, instrument, or couch to recommend and to sell, either or both being said to be capable of curing cases which were heretofore incurable—the parading of casts of deformed trunks, rendered as symmetrical as the statues of antiquity by the newly-discovered or peculiar method of treatment—the publication of books containing merely exaggerated accounts of successful cases, without even, as in some of these publications, any notice of the methods employed—the promulgation of opinions opposed to anatomical and physical truths to subserve delusion—and large promises, but scanty performances, were among some of the means adopted by the majority of those who had chosen this *speciality*, as the best calculated to fulfil the objects of their professional mission. But it may be as well to take a brief view of the methods lately promulgated, and of the progress made (!) in this department of medical practice.

46. Mr. Baynton, in 1813, advocated rest for a long time in the horizontal position, on a specially-constructed couch, but furnished no particulars of treatment.—Mr. Sheldrake, in 1816, recommended an instrument of his own to support the weight of the head, and extension on an inclined plane, &c.—Mr. Wilson, in 1820, advocated chiefly muscular exercise directed especially to the dorsal muscles, the horizontal position occasionally; and he justly condemned all instruments which are made to act from the pelvis upward, and which were then much in vogue among distortion-curers.—Dr. Jarrold, in 1823, considered curvatures to depend upon constitutional causes, treated them accordingly, and prescribed chiefly muscular exercises, burnt sponge, and carbonate of soda internally.—Mr. Bampfield, in 1824, advised muscular exercises, extension of the spine by pulling the legs and arms, frictions and shampooings, and the use of instruments to exercise particular parts.—Dr. Dods, in 1824, objected to the inclined plane, to any spinal apparatus, and to the practice of carrying weights upon the head, as directed by some of his predecessors. He employed a concave couch to bend the whole spine forward, and to relax the spinal muscles. The success of this plan must have been astounding!—Mr. John Shaw, in 1827, resorted to muscular exercises, to supports for the spine, and to extension on a couch of his own contrivance.—Dr. Harrison, after publishing numerous cases of vaunted success, and withholding any account of the means employed, produced, in 1827, a large book, which contained nothing but unsound views, exaggerated accounts, and a mystification as to his method of treatment. This, however, was nothing more than the horizontal position on a fixed mattress, friction, &c. This last he directed, by means of assistants, in such a manner as to lead his victims to persevere, and to inspire them with hopes which were rarely realized.—Mr. Stafford, in 1832, advised spinal supports, the horizontal position, conjoined with exercises.—Mr. Beale, in 1833, recommended frictions, muscular exercises, mechanical extension, and instruments in certain cases.—Mr. Coulson, in 1839, prescribed suitable exercises, and condemned, with great justice, all kinds of collars, machines, or instruments.—Mr. Ward, in 1840, resorted to the recumbent position, to exercise of the muscles of the spine and head, and objected to mechanical supports.—Mr. Tuson, in 1841, advocated principally the recumbent position on a couch of his own contrivance, that admitted of muscular exercises while recumbent.—Mr. C. R. Harrison, in 1842, published his work to say that he cured deformities of the spine and chest by exercise alone, and without extension, without pressure—the means empirically employed by his late namesake—and without division of muscles—the division of muscles having been then brought into vogue from Germany, the fruitful parent of humbug, for curvatures, for squinting, and for every thing to which credulous fools would submit.—Mr. Hare, in 1844, wrote to recommend his couch, which acted on the spine by extension produced by pulleys and weights.—Mr. Coles, in 1845, praised the prone position, for which he constructed a couch, on which the patient reposed upon his chest and abdomen, with exercise of the muscles of the spine and upper extremities.—Mr. Tamplin, in 1846, confided altogether in mechanical support by means of a steel instrument, which he contrived for this purpose, based, like many of those employed by the instrument-makers who had gone before him, to rest upon the pelvis. He condemned the horizontal position and all kinds of couches.—Mr. Lonsdale, who has furnished me, in his work, with a portion of the above information, in 1847, improved greatly on Mr. Tamplin's instrument, adding its best and most original part, and recommended a couch which appears to be the best of all hitherto employed.*

47. From this exordium the reader will perceive the amount of information to be obtained from books, each one of which is written to recommend the practice adopted by its author to the notice of a "discerning public." Physicians are nowadays allowed to have nothing to say to, far less to do with, this very notable "speciality," or indeed with any complaint respecting which speciality doctors have enlisted the "sweet voices" of the public. But physicians will nevertheless look on, and even observe closely the results, note the errors committed, mark the subterfuges resorted to, notice the delusions practised, and remark also the credulity, occasionally interrupted by passing visions of the truth, displayed by the victims during the protracted treatment of a spine doctor. The study all the while is not without interest to the philosopher; the arts and cunning displayed to conceal expected want of success, and to ensure the faith and perseverance of the patient; the resignation of the latter, and the confident dogmatizing of the former; the entire surrender of judgment, liberty, and opinion on the part of the devoted sufferer; the "hoping against hope," and the influence gained over weak minds by the assumed confidence, the decided manner, and the repeated promises of the reputed deliverer, furnish food for contemplation, and instructive illustrations of the constitution of the human mind. In this way, months, and

[* No country has been more fruitful in spine doctors and quacks than the United States. Every mode of treatment mentioned by our author as having been tried in Great Britain has had its advocates here, and not a few have accumulated fortunes by their base impositions and false pretensions. Numerous institutions have been established for the treatment of spinal deformities, where as many instruments of torture have been resorted to as were ever known to the Inquisition. There is no end to the metal splints, shoulder-braces, jackets, bandages, supporters, laces, corsets, stays, &c., which have been palmed upon the public by greedy and dishonest adventurers, who have reaped a rich harvest from the ignorance and gullability of their victims.]

even years, are passed; the submission and credulity of the one keeping due pace with the domination and perseverance of the other—the hopes entertained by the patient, that future success may ultimately compensate for the losses, and sufferings, and endurance of the past, protracting still farther the period of empirical domination, until at last emancipation arrives, and the patient awakes to her condition, and arises with emaciated muscles, impaired strength, and with loss of the use of her limbs. Nevertheless, she may not confess her delusion. The power which had so long fettered her mind and body retains still a portion of its sway; and while she feels the bitterness of her delusion, she has no desire to admit her folly, or to confess the full amount of its consequences. She consoles herself with the idea, assiduously inculcated by the persevering attendant, that, without the means of which she has been the victim, the deformity might have been much worse, and with thankfulness for this assurance, she submits to her fate, until another "unfailing method of treatment" excites her attention, when the desire of recovering her shape, or of preventing extreme deformity, again induces her to enter upon another protracted period of penance, the means being different, but the results the same as heretofore.

48. Now, after the numerous repetitions of the means enumerated above—after the endless variations, modifications, combinations, denunciations, &c., which the very imperfect list just furnished presents—what can I have to recommend, who have seldom had to deal with such cases, unless in rare instances when I have considered it right to interfere to prevent the dangerous consequences which would ensue, or were actually ensuing from a vicious system? What I, therefore, advise may be briefly enumerated in the following categories:

49. *A.* To ascertain the several, and especially the chief causes of the curvature, extrinsic or physical, intrinsic or constitutional, mental or moral; to endeavour to estimate correctly their individual influences; and to direct a decisive and scrutinizing inspection on their energetically inculcated removal and avoidance. If only one of the causes of mischief continue in operation, the best devised treatment may be inefficacious.

50. *B.* To determine accurately the extent and nature of the curvature, the amount of deformity, and the degree in which it has involved the natural positions of the pelvis, shoulders, the clavicles, sternum, and ribs; to ascertain in how far the shape and capacity of the thorax and abdomen are affected; to note the states of the digestive, assimilating, and excreting functions; to examine the condition of the muscular and fibrous structures, as manifested by the muscles of the trunk and extremities, and especially by those of the spine and by the joints; to detect whatever disorder of the thoracic or abdominal organs the curvature may be associated with; to determine the state of the circulation and of the blood as respects the presence of chlorosis, anæmia, or plethora, and to ascertain the conditions of the uterine or sexual organs; and, having acquired all the information that can be obtained respecting these, and having reviewed this information in connexion with what is known as to the causes, to consider well the indications and means of cure which the whole inquiry may suggest.

51. *C.* Having commenced thus carefully to put these intentions and means into practice, decidedly but cautiously, and in suitable combinations when such are clearly indicated:—(*a*) To pay strict attention to the restoration of the general health; to attend to the digestive and depurating functions, to the advantages of pure air, ventilation, sunshine, and suitable exercise, both before and during the employment of other means directed more especially to the removal of the curvature; and at the same time to have recourse to such tonics and restoratives as will promote assimilation.—(*b*) To have recourse to instruments only when these are imperatively required, and to select such as will admit of the movements of the spinal muscles, and press upon the convexity of the curve.—(*c*) If couches alone, or in addition to instruments, in the intervals between having recourse to them, or after due exercise, be absolutely required, to select those which furnish pressure chiefly on the convexity of curvature, and liberate the spine from the pressure and warmth of a supine position, and facilitate a recourse to frictions and other means of restoring the tone of the spinal muscles and ligaments. To each of these I would direct a more particular notice.

52. *D. The restoration of the general health* previously to, and during a recourse to the more empirical and mechanical means adopted by those who take this particular class of affections under their generous protection, is too generally neglected. Many of the causes most influential in producing curvature act chiefly by impairing the constitutional powers and the general health, by enfeebling the digestive and assimilating functions, by impeding the excreting actions, by relaxing the tone of the nervous and fibrous structures; and hence the importance of the entire removal of these causes, and of the restoration of these functions to health. Of all the causes of curvature, the most frequent, the presence of which it is the most difficult to ascertain, and the most seldom relinquished when so long practised as to produce this effect, is *self-pollution*. Its effects in exhausting organic nervous power, in emaciating the muscles, and in relaxing the ligaments, are much more remarkable than those of any other cause. Attention, therefore, should always be especially directed to its detection and entire relinquishment.

53. Restoration of the vital functions in spinal disorders should be directed not merely to the functions of digestion and excretion, but also to the conditions of the vascular system and of the uterine and urinary functions. If vascular plethora be not present—a condition which is seldom associated with curvatures—the preparations of iron are generally of service, especially if anæmia or chlorosis also exist. If neither of these be present, bitter infusions or decoctions may be first given, and afterward the tincture of sesquichloride of iron, with or without a little hydrochloric acid, and the infusion or tincture of calumba, may be prescribed accordingly; but, in cases associated with anæmia or chlorosis, the preparations of iron should be adopted forthwith, especially if the urine be alkaline or contain much of the phosphates; and, in these circumstances, the preparation just named and the hydrochloric acid should be employed, and they may likewise be prescribed if the uterine discharge be great, or leucorrhœa be present. In other conditions, or

when the catameuial evacuation is insufficient or obstructed, the sulphate of iron, with the aloes and myrrh pill, or the compound mixture of iron, with a sufficient quantity of the compound decoction of aloes to preserve the bowels freely open, will generally prove most beneficial.

54. *E.* Without due *ventilation, light, sunshine, and exercise in the open air*, short of occasioning fatigue, health will neither be restored nor preserved. Large airy sleeping apartments, the light of heaven, and *exercises* of the muscles of the back and extremities, are the most conducive to the prevention of curvatures, and to the restoration of the health of crooked persons. These persons should never ride on horseback, nor even in a carriage, when either can be avoided. Walking is the best exercise, and next to that such exercises as will moderately engage the muscles of the arms, shoulders, and back. Various modes of exercising these muscles have been recently recommended; but, whatever plan be followed, the muscles of both sides ought to be equally exercised. Certain exercises tend more to *prevent* curvature than to remove it; as the skipping-rope, shuttle-cock and battle-door, the use of dumb-bells, and exercises with the rod. The Indian-sceptre exercises described by Mr. Walker, in his work on "*Exercises for Ladies*," are the best adapted to the prevention of curvatures and to the removal of those which are slight. When the curvature is more manifest, or even very great, pulleys should be fixed, at a considerable height above the patient's head, with weights attached to them, great in proportion to her age and strength, and in a situation which will admit of their being pulled in either a forward or backward direction. A stand, also, with a cross-bar, or with more bars than one, considerably above the head of the patient, [or ladder,] may be erected in a suitable open or airy situation; and, by taking a firm hold with both hands, attempts should be made, gently and cautiously at first, to raise the body by the muscles of the arms and shoulders. When the muscular debility is great, it is generally of great service to have recourse to [electricity, or] frictions over the muscles of the spine and back with a warm stimulating liniment or embrocation, for some time previously to adopting these exercises. In 1822, the daughter of a friend had for a very long period been cased in metal instruments, and had suffered in health and strength, without any benefit as to the curvatures. I requested the instruments to be thrown aside, directed frictions to the spine and back, at night and in the morning, with the following liniment, and afterward a gradual and careful recourse to the exercises just described. The cure was rapid, complete, and permanent.

No. 366. ℞ Balsami Peruviani, et Bals. Tolutani, āā, ʒj.; Olei Terebinthinæ, ℥j.; Linimenti Saponis, ℥jss.; Olei Cajuputi, ʒjss.; Olei Olivæ, ℥jss. vel. q. s. ut fiat Linimentum, more dicto utendum.

[We have seen very decided effects produced by stimulating the withered muscles by the common electro-magnetic machine, applied for several minutes daily, accompanied by friction with stimulating lotions. Cures may be accomplished in many cases by these local means, in connexion with obedience to hygienic laws.]

55. In many cases, sponging the back with a strong solution of bay-salt, of a tepid warmth at first, and gradually reducing the temperature subsequently, will be of service, and may be employed once or twice daily. The exercises should be carefully directed, used for short periods only, especially at first, and never so long as to cause fatigue. In the intervals between exercise, the patient should assume the recumbent position—either supine or prone, or upon either side—on a firm horse-hair couch, either horizontal or very slightly inclined, and with a low pillow. If the patient recline on the side, especially on the right side, or on that which presents the greatest convexity, she ought to place a horse-hair pillow under that part, so as to thrust the convexity towards the true axis of the spine, and retain it in that position as long as she can. Sleeping with too high a pillow, and generally on the same side—most frequently the right—often of itself produces slight curvature. In these cases a different position should be chosen, the pillow ought to be placed under the side just beneath the armpit, when that side is reposed upon, and the patient should be induced to employ the arm and hand of the side on which the dorsal concavity exists.*

56. *F. The use of instruments* has been very generally advised by both qualified and unqualified persons. They are required only in the more extreme cases of curvature, and at intervals, or only when it is necessary that the spine should be supported or aided in carrying the weight of the head and shoulders. Mr. Lonsdale's spinal support is the best hitherto constructed, inasmuch as it both supports the weight of the upper parts and presses the convexity of the curvature inward, or towards the true axis of the spine. The chief objection to this and all other instruments is the material of which they are constructed; for a broad hoop of iron or steel encircling the pelvis as a basis for support and pressure, and the other metal parts forming the supports, springs, screws, &c., however well they may be padded, not only hamper or restrain the movements as long as they are applied, but also, and most injuriously, act as conductors of the electricity circulating through and on the surface of the body, conveying it into the atmosphere, especially during warm or humid states. The other instruments which I have seen, besides those just mentioned, are altogether undeserving any notice.†

* [We have derived the greatest benefit in these cases from the regular use of the shower-bath, with or without salt, and its temperature regulated according to the state of vital energy present. If quite cold (60° to 70°), it should be preceded and followed by friction.]

† [An institution was opened a few years since, in the neighbourhood of Boston, for the treatment of cases of diseased spine and spinal curvatures, in which the chief reliance was placed upon metal rachets and corsets to effect a cure. The proprietor was very successful in securing patients, but quite otherwise in restoring their various deformities. Many hundred young persons, from all parts of the country, were at various times inmates of his establishment, which, by a species of puffing and fashionable delusion, became for a season extremely popular, and of high reputation. The treatment, which was identically the same as has been tried again and again in Great Britain and on the Continent, and found unsuccessful, and consequently exploded, was entirely mechanical, and the means employed to restore the symmetry of form were in the highest degree painful and unphilosophical. The secret of the temporary success of such modes of treatment may, perhaps, be found in the fact that, while patients are under treatment, by compression and extension, &c., they may grow in height, and improve consequently in figure; their hopes and expectations are consequently raised, their friends hear of the temporary improvement, and others are induced to make an attempt to restore their deformity, and undergo the same system of torture only to meet with bitter disappointment in the end. For, as soon as this

57. *G. Of couches* it is unnecessary to say much. A common horizontal couch, firmly made with horse-hair, or one very slightly inclined, is all that is required; but it should be well provided with hair-pillows of different sizes; and, when the patient reclines on the side with the dorsal convexity, a pillow should be placed under it in such a manner as to press it upward; and when she reclines in any other position as well as in this, the pillow under the head should be low, unless, indeed, she attempts to lie on the side of the dorsal concavity, when it ought to be much higher. I have recommended this use of the pillows of the common sofa or couch for upward of thirty years in the few occasional cases of curvature which I have been requested to treat for other ailments, and I believe they are used in a similar manner by MR. SHAW. In the excellent couch constructed by Mr. LONSDALE, a broad belt passes between supports attached to the sides of the couch, and the patient, when reclining, places the belt under the convexity, and has it drawn upward; the weight of the body being in great part borne by the belt, which thus presses the convexity upward. Another couch has been employed by Mr. COLES, for facilitating the prone position and exercise with the arms when this position is retained. It is well adapted to posterior curvature or excurvation of the spine, but it should be used with great caution when this curvature is owing to disease of the bodies of the vertebræ, as will be shown hereafter.

[Dr. R. S. KISSAM, of New York, has reported a case of very bad posterior curvature of spine, from caries of the inferior dorsal and superior lumbar vertebræ, in a child of four years, cured by means of a firm corset open in front, supplied with lacings, and an aperture behind to allow the excurvated vertebræ to project, thus allowing the diseased bones to come in contact and unite, and at the same time bring the spine in an upright position.—(*New York Lancet*, vol. i., p. 178.)

The same surgeon has invented an *orthopædic chair*, to carry out the plan of treatment suggested by M. GUERIN, of Paris, viz., overcoming abnormal curvature by mechanical power, producing moderate extension and lateral pressure, so as to produce a counter-curve. M. GUERIN effects this in a bed, the patient being in a recumbent position. Dr. KISSAM accomplishes the same result by his chair, the patient being in a sitting position, allowing the patient to read, sew, &c., while the gravity of the body is made use of to promote extension. Farther pressure of an innocent nature is combined with extension and counter-curvature; the pressure upon the angular ribs promotes the counter-curvature, and does not compress the thorax. The apparatus, which is simple in its details, effects extension of the spine, contra-flexion of its curves, pressure upon the abnormal angularity of the ribs, and projecting scapula, by means of rest, in the horizontal position, pressure without extension, or Dr. GUERIN'S sigmoid flexion in the horizontal position. These means, of course, are only resorted to for the purpose of bringing the spine and ribs to their natural position, while the cure is effected by producing a just and healthy balance in all the muscles which support the spinal column, by proper exercise. If the muscles are kept at rest by constant pressure, it is evident they cannot recover their tone; exercise only can increase their strength, and modified exercise only can effect a permanent cure.—(*Loc. cit.*, p. 74.)

Whatever apparatus is used (and we believe that a large majority of cases in the young may be cured by suitable modes of exercise, &c., without any mechanical means), it should be gradually imposed upon the patient, as the muscles are not to be pained or overtasked. The whole design of extension, counter-curvature, and pressure, is to *direct* the growth of the parts implicated in a proper course. The correction of the curves and restoring the lost muscular balance must be depended upon to keep the patient well. These cases most generally occur in young girls from eleven to sixteen years of age, and, if taken at this period, the growth of the bones and muscles may be easily directed. Older subjects are cured upon a somewhat different plan. The bones of the vertebræ are displaced and hardened, and the ribs are angular, and the body has ceased to grow. It requires long-continued extension and counter-curvature to produce absorption of the thickened sides of the vertebræ, and to overcome the firmly contracted muscles. In young cases, the vertebræ are not thoroughly ossified, and easily yield to pressure, and the changes are known to go on rapidly in youth; whereas, in older subjects, absorption takes place slower, and they have lost their health, which is an additional disadvantage. Girls under eighteen can generally be cured of lateral curvature; older persons may be benefited, and prevented from getting worse. As to *cutting* the contracted spinal muscles, no surgeon, we presume, would follow the practice of M. GUERIN.]

58. IV. SPINAL COLUMN—NERVOUS OR PAINFUL AFFECTIONS OF THE.—SYNON.—RACHIALGIA (from ραχις, the spine, and αλγος, pain).—*Spinal irritation*, of several modern writers.

59. CLASSIF.—I. CLASS, IV. ORDER (*Author*).

60. DEFINIT.—*Pain in some part of the spinal column, generally accompanied by neuralgic or hysterical affections, unattended by fever or by other indications of inflammation, injury, or structural change of the vertebral column, or of its contents.*

61. Painful affection of the spinal column may be limited to a single point or part, or it may affect more than one part, or extend along a considerable portion of the column. It may be continued, remittent, or intermittent, or even periodic. It may be *nervous* or *hysterical*, *rheumatic*, *gouty*, or *syphilitic*. When the pain is connected with any evidence of inflammation or injury, or structural change, it is merely a symptom of such lesion, and may be inconsiderable, or often not the most prominent symptom. It is generally

system of compression and extension is laid aside, for it cannot always be continued, the muscles having lost their strength (what little remained), the trunk of the body, being dependent on its artificial support, begins to settle down into its former position; the shoulder presses more and more against the corsets, the arms rest upon the top of them, the suffering and the deformity increase, the hopes of the patient and friends are gradually blighted, and the protracted suffering compels them to throw off their mechanical appliances, and they become convinced of the painful truth that they have been made willing victims of an ineffectual system of useless torture. Such is, in brief, the history of nearly all who were treated in the institution referred to, and others of a similar kind; and, as long as the organic laws of living bodies remain the same, such will be the result of similar management to the end of time. By these remarks we would not be understood as wholly condemning the use of mechanical means in the treatment of the various deformities of the body, but of so employing them, in connexion with all possible modes of exercise, as to gradually restore the healthy functions. When chiefly relied upon, and to the neglect of the important laws of health, they cannot but do great mischief, and mischief only.]

difficult, and frequently almost impossible to determine, in the present state of our knowledge, the precise seat and nature of the pain which is so severely felt in the spine in nervous and hysterical subjects; but that it is chiefly functional, and intimately connected with pain in other situations, or with some other disorder, are well ascertained facts. How far these may illustrate the nature of true rachialgia will be considered hereafter.

62. i. Description.—The history and description of *spinal irritation* were first furnished by the Franks, under the denomination of *Rachialgia*, and subsequently considered by Nicod, Teale, Brown, Darwall, Tate, Parrish, Griffin, Entz, Ollivier, and Bennett. Most of these writers have viewed the complaint more or less in connexion with neuralgic and hysteric symptoms, and have overlooked some of its other morbid relations. It is generally a consequence of pre-existing disorder, more especially of hysteria, of uterine irritation or disorder, of prolonged leucorrhœa, or of excessive or disordered menstruation, of exhausting discharges, of gout, rheumatism, and several other chronic diseases, attended by debility or nervous exhaustion. It is *characterized* by pain, seated as mentioned above, increased by pressure on the spinous processes in the chief seat of pain, and often accompanied by painful, anomalous, or hysterical symptoms in parts supplied with nerves from the seat of pain in the spine.

63. i. *A. Spinal Irritation occasioning Neuralgia or hysterical Affections.*—This is the chief form in which painful affection of the spine presents itself in practice, especially in females, or in weakly constituted or debilitated males. If the reader refer to the article Sympathy, he will there find an exposition of the connexion subsisting between the ganglial, sympathetic, and spinal nerves, and of the manner in which irritation, undue excitement, or exhaustion, or altered sensibility of any one part of the sensory circle of nervous endowment, may implicate, in some way or other, distant parts—may induce severe pain in situations remote from the seat of irritation, or spasm, or various modifications of sensibility, or other anomalous affections. I have shown in various parts of this work, that irritation or other morbid states of parts of the alimentary canal, or of the uterine or sexual organs, or of the kidneys and urinary passages, may be propagated thence to the roots of the spinal nerves, to the cord, and be reflected from these by either sensory or motive nerves to internal or distant parts; and that the original seat of irritation may produce these effects, either functionally and without developing inflammatory or other palpable changes, or it may induce these changes, owing to prolonged endurance, to its violence, and to the nature of the exciting causes. (See *arts.* Chorea, Cholera, Convulsions, Hysteria, Disease, &c.)

64. The remarkable diversity of painful, anomalous, and hysterical symptoms attending spinal irritation renders a detailed description of this affection unnecessary. The more prominent features are sufficient for its recognition. The distant symptoms or sympathies are often the only ailments to which the patient has directed attention, or even of which he is cognizant. But the physician, upon hearing of these, immediately infers that the disorder is merely manifested in the extreme ramifications of the nerves, and that it is actually either seated in the origins of these nerves, or that it is transmitted to the gangliated roots of these nerves from visceral or ganglial nerves, or that it has been thus transmitted, in the first instance, but followed, owing to the intensity or continuance of the irritation, by disease at the origins of the nerves displaying the disorder. He therefore examines attentively the state of the spine, by pressure, percussion, or otherwise, especially at those situations where the nerves supplying the affected parts originate; and he often finds, although the patient has never complained of pain in any part of the spine, great pain in these situations, as well as increased disorder of the distant or external parts, when this examination is being made. Pain, more or less severe in the spine, is also excited by muscular efforts, by a sudden or quick movement or rotation of the spine, or by a jerk or slight concussion, or by taking a false step even in walking.

65. In connexion with the tenderness and pain in one or more parts of the spine, neuralgic pains, spasms or convulsive movements, great tenderness of the surface, sometimes loss or diminution of sensation, occasionally loss of motion or incomplete paralysis, and even, in severe or protracted cases, paraplegia; loss of motion being often more complete in one extremity than in the other, and sensation being but little impaired. When the spinal pain or tenderness is felt in the *dorsal portion*, it is sometimes referred chiefly to one side of the column, generally the left side, and extends to, or is felt only, beneath the left mamma, much more rarely on the right side or in the mamma itself. In these cases it is often associated with hysterical symptoms, with a sense of constriction about the thorax, or with a sense of suffocation, dyspnœa or orthopnœa, pleurodynia, palpitations, or accelerated or irregular action of the heart, spasmodic cough, and various other ailments, which present numerous changes and associations, certain of them ceasing suddenly, others appearing and becoming variously complicated, and often exaggerated by the fears of the patient, or the constant direction of the mind to them.

66. When the lumbar portion of the spine is chiefly affected, then the pains, altered sensibility, spasms, constriction, &c., are complained of in the parietes of the abdomen, or hypogastrium, and pelvis. Numbness, cramps, pains, excessive tenderness, or even more or less complete paralysis in the most severe cases, are experienced in the lower extremities, with constipation, suppression or retention of urine, or irritability of the urinary bladder or uterine organs, disordered menstruation, morbid sensibility of the genito-urinary organs, and occasionally a marked and variable alteration of the state, constitution, and quantity of the urine itself.

67. Spinal irritation of the cervical portion is not so frequent as in the situations just mentioned; but it is often connected with a similar affection of one or other of these, especially with the dorsal pain and tenderness. Sometimes the cervical pain rises as high as the occiput, and is then associated with neuralgic pains in the face or neck, with deafness or noise in the ears, difficulty of swallowing, a sense of choking, loss of voice and even of speech, spasm of the larynx or a state resembling an attack of spasmodic croup, and urgent sense of suffocation, complete aphonia, violent attack of suffocative cough, altered sensibility, or incomplete paralysis of one or both arms,

coldness and numbness of one or both hands, pricking sensations, formications, &c., in these extremities, with more or less variability and irritability of temper, and often with several of the other ailments enumerated above.

68. The spinal tenderness in some cases shifts its situation. In these, the sympathetic affections are also changed. In connexion with the symptoms already noticed, the functions of the thoracic and abdominal viscera, and even those of the organs of sense, are more or less disordered, but in various and constantly varying degrees, the seat of disorder depending much upon the portion of spine affected. When the disorder is of a very severe character; when epilepsy, convulsions, amaurotic symptoms, deafness, hesitation or difficulty of speech, retention or suppression of urine, hiccough, vomitings, gastrodynia, obstinate constipation, paralysis, &c., take place, then it becomes a matter of doubt whether or no the spinal affection has proceeded to inflammatory action, or has extended to the base of the brain, or to serious congestion of the spinal veins, with increased serous effusion; and a careful consideration of all the sympathetic and constitutional features of the case is then especially requisite.

69. *B. Rheumatic, gouty, and syphilitic* forms of rachialgia, or painful affection of the spine, especially the rheumatic and gouty, are not infrequent.—(*a*) The *rheumatic* occurs chiefly in the rheumatic diathesis; in persons who have suffered previously from rheumatism, and very probably is seated chiefly in the fibrous structures of the spinal column, in the ligaments of the spine, and probably also in the intervertebral structure. It is experienced principally on motion, and in portions of the spine which have been the seat of previous injury, sprain, twist, &c. It is generally diminished by the warmth of bed and by the recumbent posture; and it is often accompanied by several of the sympathetic affections already mentioned; but, when these are severe, and are obviously connected with the seat of pain in the spine—when cramps, numbness, constrictive pain in the muscles, prickings in the extremities, loss of motion, &c.—then the supervention of inflammatory action, or of effusion, or of thickening of the affected tissues, or of congestion of the vascular apparatus of the spine, should be dreaded, even if not actually existing.

70. (*b*) *Gouty rachialgia* is common in old gouty subjects; affects chiefly the lumbar region; is often attended by weakness or impaired motion of the lower extremities, by incontinence of urine, and by other disorders of the urinary organs, or of the urinary secretion itself, varying with the duration and amount of the spinal affection. Gouty rachialgia is chiefly to be referred to congestion of the venous sinuses of the vertebral canal; this congestion probably inducing an increased fluid effusion, with thickening of the ligaments and fibrous tissues of the vertebræ external to the canal; the functions of the cord, or roots of the nerves, being thereby more or less embarrassed.

71. (*c*) *Syphilitic rachialgia* sometimes occurs in the secondary or tertiary stage of syphilis. It may affect the bodies of the vertebræ, or the intervertebral structures, or the ligaments; but it is very doubtful whether or no it exists as a purely nervous affection in the course of this constitutional malady, before these structures are attacked by the changes characterizing the advanced progress of this malady. The portion of the spine most frequently attacked by syphilitic lesion, according to my experience, is the cervical, the spinal lesion appearing to me to have been an extension of the alterations which had taken place in the throat and pharynx.

72. (*d*) *Scrofulous rachialgia* may be referred to slow inflammatory change, or to tuberculous deposits in the bodies of the vertebræ; and hence it, as well as the syphilitic, hardly falls under the present category, but comes more legitimately under the head of *Disease of the Bodies of the Vertebræ*.

73. ii. The DIAGNOSIS of spinal irritation, or pain in the spine, appearing independently of inflammatory or structural lesion, is by no means so easy as several recent writers appear to believe. Whether the painful affections of the spine are the chief disorder, or are attended by various symptomatic disorders of a more prominent character even than their parent affection, they often so nearly approach the milder grades of inflammatory action, in some one or more of the tissues of the spine, that a precise line of demarcation can hardly be drawn between them. An affection which may be, with much justice, viewed as functional to-day—as spinal irritation merely—may be inflammatory on the morrow, and be rapidly followed by the consequences of inflammation. Or a case may occasion apprehensions of inflammation, and yet, as respects its progress and treatment, prove functional merely; while another, furnishing less serious grounds of apprehension, may have been actually inflammatory, and soon furnish undoubted evidence of the usual results of inflammation.

74. The diagnosis between functional and structural rachialgia requires a most attentive consideration of all the circumstances of the case, after a careful examination of the spine, and of the whole extent of constitutional and symptomatic ailment. Messrs. GRIFFIN, who have written with much ability upon this affection, have given the following indications of its existence, especially in its nervous or hysterical form: "1st. The pain or disorder of any particular organ being altogether out of proportion to the constitutional disturbance. 2d. The complaints, whatever they may be, usually relieved by the recumbent posture, always increased by lifting weights, bending, stooping, or twisting the spine, and among the poor classes often consequent on the labour of carrying heavy loads, as in drawing water, manure, &c. 3d. The existence of tenderness at that part of the spine which corresponds with the disordered organ, and the increase of pain in the organ by pressure on the corresponding region of the spine. 4th. The disposition to a sudden transference of the diseased action from one organ or part to another, or the occurrence of hysterical symptoms in affections apparently acute. 5th. The occurrence of fits of yawning or sneezing, which, though not very common symptoms, yet, as scarcely ever occurring in acute or organic diseases, may generally be considered as characteristic of nervous irritation."—(*Op. cit.*, p. 214.)

75. These may be viewed rather as aids to the diagnosis of this affection than as establishing its existence independently of inflammatory action; for many cases, which have been viewed merely as functional, although presenting some degree of prominence of the spinous processes, in the seat of tenderness, certainly are attended by more or less inflammatory action or congestion, with swell-

ing of the vertebral tissues, the local changes being insufficient to cause very manifest constitutional disturbance, or to disorder the vital and excreting functions. When, however, these are disordered, the existence of inflammatory action or congestion should be suspected. In all cases presenting swelling or prominence in any marked degree, it will be safer to view this as a result of a mild and slow form of inflammation or congestion, or inflammatory congestion, with slight effusion, than to consider the disorder as merely nervous. (*See the Description of Disease of the Vertebræ.*)

[In 54 cases of "spinal affection" or irritation treated by him, Professor Austin Flint found that in 22 cases there was extreme *tenderness* over the spine; over the *dorsal* vertebræ alone in 21 cases; over the *lumbar* and *dorsal*, there was great tenderness in 10; over the *cervical* and *dorsal* in 3; and over the entire column in 5. The extent of tenderness varied in different cases; in some it was confined to a single vertebra, in others it embraced several, or extended over a whole division. (Dr. F., however, does not consider tenderness as essential in order to indicate an affection of the cord.) In all but 7 cases, modifications of *sensibility* were more or less prominent symptoms; in 14, pain in the head was a prominent feature; in 9 cases, pain in the chest was prominent; in 15, the location was in the abdomen, or abdominal parietes; in 6, the uterus was the seat of the principal sensations; while in 7, pain in the lower extremities was complained of; in 4, in the upper; in 2, both upper and lower were simultaneously affected; in 3, pain was felt in the spine itself; and in 2, the trifacial nerve was affected. In 19 cases there was great *depression of muscular power*, and it was strongly marked in 16 others; in 27 cases there was *perversion of the feelings*, as loss of energy and buoyancy of spirit, despondency, melancholy forebodings, great anxiety on the subject of health, susceptibility to emotions from slight causes, &c. In 37 cases, there was marked *derangement of the digestive organs*, and only 13 in which it was absent; of 25 females, in 6 cases there was *menorrhagia*; in 11, *leucorrhœa*; in 4, *uterine pains*; in 3, *too frequent menstruation*; and *amenorrhœa* in 1. Some *difficulty in urinating* in 8; 5 were cases of pregnancy, and the spinal difficulty was aggravated during this condition. Of the 54 cases, 15 laboured under *palpitation of the heart*; in 2, the pulse was intermittent; in 6, accelerated; in 16 cases the *respiratory organs were morbidly affected*; in 1, a sense of suffocation; in 4, dry cough; in 1, paroxysmal cough; in 2, cough without expectoration; in 4, sense of oppression in breathing, complicating palpitations; dry, hacking cough, 2; and 2, convulsive, catching inspirations, with sense of suffocation; in 6, paroxysms *of sinking and prostration*; in 1, giddiness and tinnitus, &c., besides numerous occasional complications.

The causes, as enumerated by Prof. F., were exposure to cold, over-exertion, severe exertion of upper extremities, remittent and intermittent fever, prolonged lactation, too frequent child-bearing, mental anxiety and afflictions, intemperance conjoined with sexual excesses, leucorrhœa, sudden cessation of the menses, deranged menstruation, development of the catamenia, sedentary positions, local injury. The probable remote causes may be divided into two classes, according as, 1st, the effect is exerted directly and primarily upon the spine; and, 2d, indirectly and secondarily, by irritative influences transmitted through the incident nerves, or as consecutive to certain general conditions of the system.—(*Am. Journ. Med. Sci.*, vol. vii., N. S.)

We refer to Prof. F.'s paper as the most philosophical and the best resumé of facts hitherto published on this subject in our country.]

76. iii. The Duration and Prognosis of spinal irritation require but slight notice.—(*a*) The *duration* of this disorder is most variable. It may be only three or four days, or as many months, or even as many years, according to the severity, the causes, and the treatment of individual cases. There is every reason to infer that the more obstinate cases, especially where the treatment has been judicious, is perpetuated either by the continuance of their causes, or by a chronic or recurring inflammatory congestion of one or more of the tissues of the spine.

77. (*b*) The *prognosis* of this affection is generally favourable, where it is purely nervous or functional.* But when it is attended by phenomena, local and constitutional, indicative of any degree of inflammatory congestion, the several contingencies of such disorder, as respects both the vertebræ and the spinal contents, should be kept in view, and a more cautious or guarded prognosis be given. When rachialgia occurs in connexion with rheumatism, or gout, or scrofula, or syphilis, a much less favourable prognosis ought to be given than when it is more purely nervous, or simply congestive or inflammatory. In the rheumatic variety there is danger of the affection extending from the ligamentous or fibrous structure to the membranes of the spinal cord; and in the gouty form, especially if it be associated with disorders of the secretion or excretion of urine, a favourable result is often long deferred, or even unattainable in very aged persons; while in the scrofulous and syphilitic states of the affection, disease of the bodies of the vertebræ, if not constantly, is generally present, and the prognosis is consequently very unfavourable.

78. iv. The Causes of spinal irritation have been already noticed (§ 16, *et seq.*) when treating of the causes of spinal diseases generally; but there are certain causes which are more especially productive of painful or functional disorders of the spine. These are certainly much more frequent in females than in males, the female clothing and physical education of the sex favouring, as shown above (§ 18), this result. Of 248 cases adduced by Mr. Griffin, 26 only were males. It may occur at any age between 10 and 65; and the gouty and rheumatic forms at much more advanced ages. The nervous variety, the most common in females, is met with from 15 years of age to 65, but most frequently from 20 to 25; in its hysterical form from 15 to 50, the menstrual epoch of female existence. It is much more frequent in the unmarried than in the married, and is not confined to any particular habit of body or temperament; the nervous and lymphatic temperaments, however, predominating. The most common exciting causes are, self-pollution, excessive sexual intercourse, uterine disorder, affections of the stomach and bowels, the presence of worms in the intestines, or other sources of irritation, as morbid secretions, fæcal accumulations, inordinate exertion, sudden muscular efforts, sprains,

* [A large majority of these cases may be temporarily relieved, few permanently cured.]

exposure to cold and moisture, anæmia, rheumatic fevers or chronic affections, &c.*

79. v. The Nature of spinal irritation has been much discussed. The pain in the spine, whether it be constant or remittent, or excited only by pressure of the spinous processes in the seat of the affection, can be viewed merely as a symptom of some lesion, functional or structural, either of the tissues constituting the column, or of the cord, membranes, or nerves, and in this respect it is, like the more distant symptoms and sympathies attending it, merely an external expression or manifestation of that lesion, whatever it may be. As no opportunity of examining after death a patient who has been the subject of this affection has occurred, as far as I know, until it has passed into undoubted structural change, and become attended by either inflammatory action or by paraplegia, it is difficult to infer with any precision what is the nature and exact seat of the affection; but there is every reason to infer, with Ludwick, Hoffmann, and the Franks, that it is connected with, if not the result of, congestion of the spinal circulation. The existence of congestion of the venous sinuses of the spine must necessarily affect the capillary circulation of the cord and its membranes, and the amount of the fluid interposed between them; and, as a consequence of the amount or extent of these changes, the functions of this part of the nervous centres, both sensory and motory, and of the nerves proceeding from it, must thereby be more or less disordered. That inflammatory action, or inflammatory congestion, or, indeed, any form of chronic inflammation, or its usual results, is not the primary lesion in the purely nervous or hysterical rachialgia, may readily be admitted, when we consider the exhausting nature of its causes, and that exhaustion of organic nervous or vital power always is productive of congestion in parts on which the causes of the exhaustion more immediately act. But it may be as readily allowed, that chronic inflammation is the more prone to supervene in these parts, the greater or more persistent the congestion, especially if the usual causes of inflammation come into operation. I have seen not a few cases of rachialgia, which had been evidently merely congestive or functional at the commencement, but which, by neglect, or improper treatment, had passed into chronic inflammation of the spinal membranes; and I have even seen some of these, owing to superadded causes, or to perturbating influences, pass into an acute state, the inflammation extending along the membranes, until it reached the base of the brain, and terminated in phrenitic delirium, coma, and death.

80. vi. Treatment.—Rachialgia, according to the local and constitutional symptoms and circumstances of the patient, requires very different, and even opposite, means of cure. The spine ought to be carefully examined, and the habit of body of the patient and the causes of the complaint fully considered, before the intentions of cure are entertained. The particulars to which the attention of the physician should be especially directed are: 1st. The presence or absence of local inflammatory signs, of general vascular disturbance, and of plethora or of anæmia; 2d. The situation of spinal pain and tenderness, and its relation to existing sympathetic affections; 3d. The presumed or ascertained causes, and the aggravating circumstances; 4th. The existence or non-existence of interrupted, disordered, or suppressed evacuations, especially the catamenial, and the hæmorrhoidal, where this latter has been often a cause of complaint; 5th. The nature and amount of uterine or sexual disorder with which the spinal affection is allied.

81. *A.* If there be actual evidence of inflammatory action or congestion of any of the spinal structures furnished by the local signs and constitutional symptoms, *local vascular depletions*, according to the severity of these symptoms, and the state of vascular fulness, as indicated by the pulse and condition of the veins, are obviously required, the amount of depletion being guided by the indications furnished by these sources. The situation from which the blood should be taken has been the topic of some discussion. J. Frank considers that local depletion attracts the flow of blood to the seat of depletion, and he therefore recommends the application of leeches to the anus. If rachialgia be connected with scanty, interrupted, or suppressed catamenia, or suppressed hæmorrhoids, leeches may be applied to the anus, or below the groins. In these circumstances, there can be no objection to these situations being adopted; indeed, they are the most likely both to restore the suppressed discharge and to relieve the local affection. But in other cases, there can be but little risk incurred from cupping, or applying leeches on each side of the affected portion of the spine, or even a little above or below this part.

82. *B. Blisters* and *counter-irritants* of different kinds have likewise been recommended by several recent writers. J. Frank disapproves of their application over or near the affected part of the spine. I have not seen sufficient cause for not having recourse to them, even in these situations, although they are often employed when they are not obviously required, and where recovery would take place without them. A blister, however, is often very beneficial, and its repetition may be necessary. Mr. Tate, who has very justly insisted upon the connexion of this affection with disorders of the uterine functions, prefers the inunction of the spine with the tartar emetic ointment. I have found the liniments or embrocations here prescribed much more certainly beneficial than any other local application or

* [Cases of spinal irritation, or neuralgia of the spinal nerves, are not as frequently met with now as formerly, when they were of every day's occurrence, and for the most part in females. There can be no doubt that the principal predisposing cause was the habitual use of corsets and stays, worn tightly for the purpose of improving the form. In consequence, the muscles and ligaments of the trunk became unusually lax and attenuated; for the compression of the body by means of materials sufficiently firm to afford an unnatural support, while it supercedes, in a great measure, the necessity of muscles and ligaments about the chest and spine, prevents their accustomed growth and strength. Thus the spine, in the ordinary avocations and exposures of life, is constantly liable to injury from strains, falls, and the application of violence to the vertebræ. The medulla spinalis receives concussion, or the nerves, as they issue from the intervertebral foramina, are subjected to pressure, and disease supervenes; and this happens with more certainty if, as sometimes happens, the individual is at the time of an accident divested of her unnatural support. Still greater injury, perhaps, results, indirectly, from compression of the stomach, liver, and lungs, the injurious effects of which, acting primarily on the viscus, are thrown by reflex action on the spine. Thus Cruveilhier maintains that affections of the stomach, heart, liver, and lungs frequently coincide with pains in a fixed point of the vertebral column, varying according to the organ diseased, which spot he calls the *dorsal point*. To this point he recommends that remedies should generally be applied in visceral disorders.]

external irritant; and either may be employed some time after a blister has been applied.

No. 337. ℞ Linimenti terebinthinæ, ℥ij.; tinct. opii, ℥j.; olei olivæ, ℥ss.: olei cajuputi, ʒj. M. Fiat linimentum, vel embrocatio ope spongio-pilei applicanda.

No. 338. ℞ Linimenti camphoræ comp. et linimenti terebinthinæ, ää, ℥jss.; vini opii, ℥j.; olei cajuputi, ʒjss. M. Fiat embrocatio, vel linimentum.

83. Even when local depletion is required, restoratives, tonics, or antispasmodics may not be the less necessary; but in all cases the adoption and the selection of these ought to have especial reference to the ascertained and inferred causes, to the state of the urine, and to the particular character of the sympathetic affections—neuralgic, hysterical, or spasmodic. If there appear reason to infer that the affection has been occasioned by masturbation, even local bleeding will generally be injurious, chalybeates or other tonics and restoratives being requisite; but when the complaint has arisen from this vice, or from excessive sexual intercourse, even the best means cannot be of service unless these causes are relinquished. In females, both the spinal affection, and the uterine or hysterical disorder, with which it is generally associated, equally (although either of them may primarily) arise from this vice, and are perpetuated by persistence in it; and hence the use of the speculum uteri, and of other phalloid instruments, is so gratifying to the patient. In all cases, the urine should be carefully tested, and the treatment regulated conformably with the states presented by it, as fully described in the article on the Urine, and on the disorders connected with this excretion.

84. *C.* When spinal irritation is associated with suppression of the catamenia, then the application of leeches below both groins, two or three days previously to the expected period, and the exhibition of equal quantities of the aloes and myrrh pill, and of the biborate of soda, or of the compound iron mixture and compound decoction of aloes, in doses sufficient to act freely on the bowels, will frequently be efficacious; more especially if the embrocations prescribed above, or No. 311, in the Appendix, be applied to the spine, and repeated according to its effects. In many of these cases, not only are the catamenia irregular, sometimes excessive, but more frequently defective, scanty, suppressed, or difficult and painful; a more or less profuse or continued leucorrhœa often replacing the healthy periodic discharge. In some, these complaints are farther complicated with anæmia or chlorosis, and ultimately terminate in irremediable visceral disease. The treatment of these complications, even in their milder forms, is always difficult, and in their severe forms often hopeless, especially when the vice in which they originate is persisted in. The spinal and the sexual disorder frequently act and react on each other, until ultimately paraplegia and various associated evils are produced. The uterine affection suggests either vaginal injections or an examination per vaginam; the speculum follows, and various applications are made to the os uteri, of a stimulating, astringent, or irritating nature. As the os uteri possesses an organic sensibility but little, if at all, inferior to that manifested by the clitoris in the sexual orgasm, neither the vaginal injections, nor the phalloid instrument, nor the applications made by its aid, are at all unpleasant to the self-polluted female. The local irritation thus produced increases, or at the least perpetuates, by nervous communication, the spinal affection; and after the constant attendance of "ladies' doctors" for many months, or even years, the patient having become paraplegic or generally paralyzed, and having continued in this state for months, requiring the urine to be drawn off twice or thrice daily, besides other aids, ultimately dies from the extension of disease to the cerebral membranes, or from organic changes in the spinal cord, or in its membranes, or in the kidneys, or in some other organ.

85. As the patient sows, in such cases, so she reaps. But let not the treatment be a perpetuation of the cause of the malady in a different form—let not the physician furnish not merely a novel mode, but even a new instrument of self-pollution, and thus minister to the accursed moral taint of his patient. In many cases, doubtless, this is done unknowingly, by his adopting a method brought into vogue by others and pleasing to the patient, and by his ignorance of this cause of these complaints—a cause which obtains in at least nine cases out of ten. In most of these the patient will confess to the vice which has occasioned the disease, if the matter be judiciously managed; and even if this vice should not be admitted, a full exposition of the consequences of persisting in it will produce a good effect; for many patients sin from ignorance, and are not conscious of the evil they are committing. I have had many instances illustrating this position brought before me. Others (but these are comparatively few) persist in this cause, and either require some restraint or go on, until a drivelling amentia, or irremediable structural disease, overtakes them. When there is reason even for suspecting the existence of this vice, the physician does not discharge his duty to his patient, and to the family of the patient, if he does not investigate the case as circumstances will suggest or admit of; for, if this cause be continued, a cure will be impossible, but by relinquishing it, remedies will be successful, and even the efforts of nature will of themselves be often efficacious. There is one circumstance, which may not be known to many of those who are so much in the habit of recommending stimulating and astringent injections, and irritating or escharotic substances, to the os uteri, by the aid of large glass or other syringes, or of specula—namely, that similar, and even many of the same, substances were thus employed by the ancients, and by the Chinese and Tartars from remote ages, to excite or to gratify the sexual desires; and that the modern treatment, by these means, of uterine disorders, whether allied or not to spinal irritation, can neither permanently cure these complaints, nor remove "a rooted evil" from the mind.*

86. *D.* When the spinal affection is associated with neuralgia, then the preparations of iron, or the sulphate of iron and sulphate of quina, with

* [Professional opinion seems to be quite unsettled as yet in Great Britain, as well as this country, with regard to the use of the *speculum*, Drs. Lee, Marshal Hall, Copland, and others being strongly opposed to its use, while Drs. Bennett, Locock, Murphy, Simpson, and other high authorities abroad are its strong advocates. The objections are partly moral and partly physical. Dr. Hall says that "a woman on whom the speculum has been used is never the same, *morally*, she was before;" while Dr. Locock pronounces "all the talk about the indelicacy of the use of the instrument to be nonsense." While we would advocate the strictest, and all necessary delicacy, in the treatment of female diseases, and would condemn all needless personal exposure, we would never-

camphor, hyoscyamus, and as much of the aloes and myrrh pill as will keep the bowels freely open, will be of service, the embrocations prescribed above being applied to the pained portion of the spine; or the treatment advised for Neuralgic Affections may be adopted. If the spinal disorder have been induced by masturbation, or if it be connected with suppressed or scanty catamenia, the combination of substances just now recommended will be of service. If, on the other hand, it be associated with leucorrhœa, or with a superabundance of phosphates in the urine, or with involuntary pollutions, the tincture of the sesquichloride of iron, with a small addition of hydrochloric acid, may be prescribed, with the infusion and tincture of either calumba or quassia. In most cases of spinal irritation, the treatment should depend, in great measure, upon the character of the associated or sympathetic affections—whether neuralgic, spasmodic, or hysterical; due attention being also paid to the digestive, assimilating, excreting, and uterine functions But unless the causes be recognised and avoided, unless correct hygienic measures be also adopted, based upon the predisposing and exciting causes above insisted upon (§ 16, 78), the treatment will very frequently be inefficacious.

87. In some prolonged cases of spinal irritation or congestion, associated with uterine disorder, complete paralysis of the bladder, irritability of the stomach, constipated bowels, and paraplegia, especially as respects the function of motion, sometimes occur. This severe form of the disease generally results from self-pollution, and often resists almost every kind of treatment, if this vice be not discontinued. I have seen several cases of this kind, and the means which I have found most efficacious are, the assiduous application of one or other of the embrocations or liniments already recommended along the spine, and the use of the iron or myrrh mixture, conjoined with the decoction of aloes, or the pills prescribed above (§ 53, 84). Various other means have been also employed, according to the features of particular cases—as the iodide of iron in sirup of sarza, or the iodide of potash in tonic infusions, and occasionally the resinous extract of nux vomica, conjoined with the aloes and myrrh pill. In a severe case of this kind, attended by vomitings, retention of urine, suppression of the catamenia, &c., which I saw with Mr. Flockton, a large pea-issue was made in the inside of both thighs, close to the groins, and a free discharge procured. The paraplegic and other symptoms soon disappeared, and the patient was quite recovered in the course of a very few months.

88. When spinal irritation or congestion has become chronic, it is sometimes accompanied with attacks of faintness or leipothymia, and, in rare cases, with cataleptic seizures—with the latter, chiefly when the affection has been produced by manustupration. In these, the treatment already advised, or that prescribed in the articles on these affections, will be appropriate. These disorders are chiefly aggravated forms of hysteria, and are to be treated conformably with the principles insisted on under the heads of Debility, Faintness, Hysteria, Neuralgic Affections, and Spasm; and for these, as well as for spinal irritation and spinal curvature, a digestible and moderate diet, at regular, but not too long intervals between the meals, gentle exercise in the open air, change of air, of scene, and of locality, a residence in a dry and temperate situation, the use of chalybeate mineral springs, or of such mineral waters as the state of the catamenia or of the urine in individual cases will suggest, are important remedies—indeed, the most requisite elements of the treatment of this group of disorders.

89. *E.* When rachialgia is connected with *rheumatism*, or with *gout*, or with *scrofula*, or *syphilis*, the local means already advised may be employed, according to the features of the case; but the treatment should be in a great measure based on the constitutional complaint, of which the rachialgia is merely a manifestation. In some cases, particularly the rheumatic, gouty, or scrofulous, leeches may be applied, and even repeated, to or near the affected portion of spine, and be followed by blisters or by the terebinthinate embrocations, and a constitutional or internal treatment suited to the peculiarities of the case, especially by the iodides in the preparations of sarza, the iodide of potassium with the solution or carbonate of potash, and tonic infusions or decoctions; or the bichloride of mercury, taken with a full meal, or in a tonic infusion; or Donovan's solution of the iodide of mercury and arsenic, and the preparations of sulphur subsequently, or the sulphuretted mineral waters. In these forms of the complaint, as well as in the nervous or hysterical, avoidance of the causes, a due promotion and regulation of the digestive and depurative functions, and strict attention to diet, regimen, exercise, air, locality, and the purity of the water in use, are essential parts of the treatment.

[Of all the local means of treating spinal irritation, we regard cupping, with or without scarification, as generally producing the most satisfac-

theless protest against all insinuations designed to impeach the motives, or cast reproaches upon medical men who believe that a certain class of female diseases may be treated more successfully by the aid of the speculum, than without it. Where life and health are involved, the question of delicacy or indelicacy is in abeyance; all such considerations must yield to the exigencies of the case. The only question here is, Can our diagnosis be rendered more certain by the aid of this instrument? No one will deny that we can, by its assistance, accurately ascertain the different external morbid conditions of the cervix uteri and its orifice, and in many instances the nature and extent of disease affecting its cavity; in short, that the eye, by its use, as well as the touch, is made to assist in the diagnosis of this class of diseases; for, while the latter enables us to recognise structural changes in the bulk, firmness, and sensibility of those parts, the former enables us to rectify an erroneous or perfect an incomplete opinion, by showing the nature and limits of ulceration, induration, excoriation, &c., the appearance of the cervix and vagina in various stages of disease, and the colour and consistency of the accompanying discharges, &c. Useful, then, as it sometimes unquestionably is, there can be no doubt that its use has been too indiscriminately and unnecessarily urged. In slight cases of leucorrhœa and uterine irritation, its employment is alike unnecessary and prejudicial, while in cases of chronic leucorrhœal discharges, or chronic menorrhagia, or wherever there is reason to suspect structural changes in the organ, we should not hesitate to resort to its employment. We believe it should rarely, if ever, be used in very young females; and there are certain diseases, as steatomatous tumours in the walls of the vagina, ovarian growths in the recto-vaginal septum, polypi, deep ulcerations in, or excessive sensibility of, the vagina, large cauliflower excrescences, or bleeding fungi, which contra-indicate its use. In short, to use the language of Dr. Ashwell, "making every deduction, which the enthusiasm of some individuals in its favour demands, the speculum must be regarded as a most important addition to our diagnostic and curative means. It enables us not only to discover, and nicely to distinguish the otherwise concealed diseases of the inferior or cervical portion of the womb, but, by the light which it throws on the seat of the mischief, it affords great facilities in the exact application of remedies. It is much to be wished that the advantages which it is capable of conferring were more early and extensively realized."]

tory results. Large cups are preferable, and as many should be applied as practicable, bearing them in contact as long as the patient will endure them. A single cupping will often produce instantaneous relief from local pain or disordered function, perhaps of long previous duration. Where an immediate impression is desired, sinapisms, or Granville's lotion, we have usually found very efficient; but in employing friction, care should be exercised not to employ too much force, else the difficulty may be aggravated. For permanent irritation, the *Tart. Ant. et Potas.*, combined with *Pix Burg. Emp.*, &c., so as to form a plaster, is perhaps the best. Where a less degree of counter-irritation is desirable, capsicum in variable proportions may be substituted for the antimony. Irritating applications, however, in very susceptible individuals, may possibly aggravate the local difficulty for a time; but even where the disorder is temporarily aggravated, it is often subsequently relieved by the revulsion thus occasioned. Some practitioners are in the habit of making caustic issues over the spine in these cases, but the practice has not proved very successful in our hands, and we cannot recommend it. Quinine, aloes, and iron are the most valuable internal remedies, given in various doses and combinations, according to circumstances. A strict attention to diet, exercise, and regimen, cannot be too strictly enjoined. The diet should be nutritious, of easy digestion, and of an unstimulating nature—coffee and tea being prohibited, with tobacco and alcoholic drinks. All violent exertions, and a too long continued erect posture, are to be avoided. A recumbent position during a portion of the day, at least, is advisable. Late hours, and all excitement of body or mind, are to be avoided. All vicissitudes of temperature are to be cautiously guarded against by suitable dress.]

90. V. Concussion of the Spinal Cord.—The nature and extent of injury sustained by the spinal marrow, in circumstances of violence which occasion concussion of this part of the nervous system, can rarely be ascertained soon after its occurrence, and sometimes not even after death. —*A.* The *causes* of concussion are, generally, falls from a height on the back or trunk, or upon the hips, upon the ground, or even upon any partially yielding surface that may not occasion fracture or dislocation. A violent blow on the back, jumping from a height, a railway concussion or shock, or any sudden or violent succussion of the trunk, also may occasion it, in a slight or in a severe form, according to the circumstances of the case.

91. *B.* The *symptoms* vary with the violence and nature of the cause, but consist chiefly of an impairment in slight cases, and of a more or less complete extinction in severe cases, for a longer or shorter period, of the functions performed by the spinal cord. There is loss of voluntary motion and of sensation, either or both of which may be partial or complete, especially of motion; the excreting functions being generally more or less affected, and the functions of respiration and circulation much disturbed. In most cases, particularly when the concussion has been violent, diminution of temperature, failure of the pulse, pallor, and the other phenomena characteristic of *physical shock* (see *art.* Shock), are also present.

[Dr. Abercrombie has recorded a case of permanent paraplegia, produced by concussion of the spinal cord, without dislocation or fracture, and a case of a similar kind has fallen under our own observation. A Mr. P. fell from his wagon on the 28th of August, 1848, striking on his head and shoulders, and was taken up completely paralyzed in the arms and lower extremities, both as to sense and motion. The knees were inclined to fall together, the hands were flexed upon the wrists, the thumbs and fingers turned in upon the palms of the hands. The head had, in the fall, been thrown backward under the body, occasioning a violent flexion of the cervical vertebræ, and it was thought at the time that there was a partial dislocation of the 6th cervical vertebra. For a while the catheter had to be used to draw off the urine, after which both urine and fæces passed involuntarily. Sensation gradually returned, but the loss of motion was permanent; extensive sloughing of the thighs, scrotum, penis, &c., occurred about six months after the injury, with anasarca and ascites, from which he gradually recovered.

In April, 1854, six years after the injury, his condition was as follows: Sensation partially restored, motion not; limbs much emaciated, flexor tendons of legs, arms, and fingers permanently contracted, surface generally cold, pulse feeble and 90 per minute, profuse sweats upon slight exertion, great weakness and debility, sits up but little, appetite poor, secretion of urine copious, and discharged involuntarily; severe and constant pains in back and limbs, extremely restless, sleep disturbed and not refreshing, bowels move but once in 48 hours, and then involuntarily; can move the shoulders and body by great exertion, obstinate sores on thighs and hips, slight cough, tongue thickly furred and flabby, digestion bad. Soon after this date, his food and drink were constantly ejected from the stomach soon after swallowing, without nausea or sickness, sloughing and emaciation increased, pain and involuntary twitchings of limbs were constant, respiration much disturbed and frequent, pulseless for several days before death, which occurred on the 7th of May, 1854. Autopsy disclosed great softening and disorganization of the spinal marrow within the fifth and sixth cervical vertebræ. There was no perceptible diminution of the vertebral canal, neither fracture nor dislocation, and the softening was confined to a portion of the cord above mentioned. The membranes were highly vascular and thickened. In short, the appearances justify the conclusion that it was a simple case of concussion of the cord, with perhaps laceration.]

92. *C.* The *appearances after death* are frequently so slight, or, even when most manifest, are altogether such as are insufficient to account for the effects in rapidly fatal cases; and, in those of longer duration, they are generally consecutive upon the change more immediately produced by the concussion. It may be presumed that, in those cases of severe concussion which are soon followed by dissolution, and yet present no appearance of lesion, the intimate organization of the cord has sustained an injury incompatible with the discharge of its functions and the continuance of life, although the injury may escape the detection of our senses. In cases of longer duration, softening of the cord, with or without inflammatory appearance, either in the cord or in the pia mater, is often observed; but frequently the softening follows rapidly upon the concussion before inflammatory action supervenes, or even before it has had time to appear.

93. *D.* The *treatment* of concussion of the spinal cord differs not in any respect from what I have

recommended when treating of SHOCK (§ 19, *et seq.*)

[As soon as reaction occurs, general and local bleeding will be generally proper to prevent inflammation and congestion, aided by the warm bath and hot anodyne fomentations. The patient should be kept for some time in a *recumbent* position, avoiding pressure on the spinous processes, and strict antiphlogistic regimen enjoined. The repeated use of purgatives will be proper, and a succession of flying-blisters over the seat of the injury, to be succeeded by stimulating liniments, and friction both to the spine and lower extremities. After the inflammatory stage has passed, electricity, tonics, strychnia, and even diffusible stimulants, will often be advisable; but the case must be regarded as inflammatory as long as pain remains in the course of the vertebral column. If paraplegia continues for a long time after the accident, caustic issues, close to the contused or painful vertebræ, may in some cases prove beneficial. (*See Ed. Jour. Med.*, Jan., 1818.)]

94. VI. SPINAL COLUMN.—INFLAMMATION AND CARIES OF THE VERTEBRÆ.—SYNON.—*Inflammation of the vertebræ, and of the intervertebral substances; Mal vertebral*, FR. *Pott's disease of the spine; Spinitis; Inflammation and caries of the spine.*

CLASSIF.—III. CLASS, I. ORDER (*Author*).

95. DEFINIT.—*A dull and generally a continued pain in some part of the spine, with slight fever, manifested chiefly towards evening, and often attended by a sense of constriction around the trunk in a situation corresponding with the affected portion of the spine, terminating generally in caries, or in symptomatic abscess, or in both.*

96. 1. DESCRIPTION.—The structures constituting the spinal column are liable to inflammatory action, from sprains, injuries, external violence, from cold, and from constitutional vice or a morbid diathesis. The inflammation thus produced may advance silently and slowly for a considerable time, and suddenly assume a more active or acute form: the affection may even be sub-inflammatory at first, and escape detection, or it may be more acutely inflammatory, and more manifestly declare itself, but it is commonly chronic or slow in its progress. When the disease appears in the scrofulous diathesis, as it does in the majority of instances, it then consists of tuberculous deposits in the cancellated structure of the vertebræ, and can hardly be viewed as inflammatory at the beginning, although it becomes so, in some measure, owing to the irritation caused by the morbid deposit. When it thus proceeds from tubercular deposits, the cancellated bodies of the vertebræ are generally their seat. But it may appear, especially in weak or cachectic constitutions, independently of tubercles, although this occurrence is comparatively rare, and commence either in the intervertebral substance, or in the bodies of the vertebræ, or even in the ligaments covering the spinal column, and ultimately involve the other structures. A recent writer justly remarks, that "the vertebræ, in their natural structure, are extremely cancellated, and of a vascular texture; and any increase in the circulation of this part may induce inflammation. The ligaments covering the spinal column are also extremely vascular, and the vessels supplying both freely communicate; so that when any increased vascular action is set up in the structure of either, it may continue for some length of time, and vary considerably in its activity, relatively to its cause. We observe an example of this in cases where the ligaments are strained by some sudden or powerful exertion. This brings on inflammatory action, in which the cancellated structure of the bones participates, owing to the free communication of the vessels of these two parts."—E. W. TUSON, *on Curvatures of the Spine*, &c., p. 218, 8vo. London, 1841.

97. *A.* Inflammation having commenced, it may continue a long time without giving rise to any severe symptom, until at last the motions of the spine, by perpetuating and aggravating the inflammation of the fibrous membrane covering the bones, cause thickening or swelling of it, which, with the products of the inflammation thrown out within the spinal canal, occasions pressure or irritation of the cord, or of the roots of the nerves, and the various spasmodic and paralytic symptoms which sooner or later supervene. Whether the disease commences in this more unequivocally inflammatory form, or in that of tubercular infiltration of the cancellated structure, on which the inflammation is contingent, the progress it makes is slow, and its nature frequently not clearly declared. There is generally pain in the portion of the spine affected; but this is the case in rachialgia; so that it is difficult, and often impossible, at an early stage to distinguish between this complaint and that, until the inflammation has induced dangerous changes. (*See the Diagnosis.*)

98. When the disease of the cancellated structure is produced by tubercular infiltration, as it is most frequently, the spinal cord and its membranes are then very rarely implicated until caries has occurred, this lesion often then irritating and affecting the ligaments and membranes, and producing the same symptoms, especially spasms, cramps, paralysis, &c., as generally, at a much earlier period, accompany chronic inflammation of the ligaments covering the bodies of the vertebræ, or of the intervertebral substances. In whichever tissue the inflammation may commence, or whether it originates in this state of morbid action, or in tubercular deposits in the cancellated structure, softening of the bodies of the vertebræ generally results, and the softened structures yield to the weight of the superincumbent parts of the body, and ultimately caries take place. POTT, who was the first to describe accurately this affection, viewed it as generally scrofulous. PALETTA, however, contended that this is not the case, and that it often arises independently of the scrofulous taint. In this view POTT has been supported by BOYER, DUGÈS, and others. Nevertheless, PALETTA is in the main correct, for it sometimes proceeds from the following causes, independently of scrofula, although these causes will very readily induce it in the scrofulous diathesis also.

99. *B.* The *predisposing* occasions of the malady are not infrequently severe attacks of exanthematous fevers, unwholesome or insufficient food, and a humid or impure air in childhood; masturbation about the period of puberty; a syphilitic taint, or general cachexy, and the excessive use of calomel, or of other mercurials in childhood or infancy. The most common *exciting* causes of the inflammatory states of the affection are exposures to cold, external injuries—as falls, blows, sprains, severe jerks, or sudden twists, or forcible rotations of the spine, and over-exertion of the muscles, especially in endeavouring to lift very

heavy bodies. A blow over the lower dorsal or upper lumbar vertebræ, particularly when a child or young person is struck in this situation, is very remarkably injurious; for the weight of the upper part of the body carries this part backward with a sudden jerk or impetus, while the parts struck are as forcibly driven forward. The results are, if the blow be severe, either a luxation or sub-luxation of two or more of the vertebræ, or a rupture of, or severe injury to, the ligaments and intervertebral substance. The more manifest effects of injuries of this nature may not become manifest until some months have elapsed from their receipt. In such cases, inflammatory action of a slow or chronic kind is occasioned; and this is followed either by thickening, swelling, effusion, or purulent infiltration between the membranous ligaments and the bone, and, as a consequence of the latter changes, by caries of the bodies of one or more vertebræ, or by infiltration of puriform matter between the ligaments and muscles, thereby causing symptomatic abscesses. Disease of the bodies of the vertebræ, proceeding on to caries, consists, 1st, of inflammation of the cancellated structure—of an *ostèitis vertebralis* of some writers, the *ostéite raréfiante* of M. Gerdy; and, 2d, of tubercular deposits in this structure.

100. *C.* Inflammation commences with increased vascularity of the surface of the affected vertebra, followed by erosion or incipient ulceration. At a more advanced period, the body of the vertebra is swollen, injected, and of a deeper red colour. At the same time, its structure is less dense, softer, and more friable, and is hence more disposed to yield, or to be compressed or injured by the weight of the superincumbent parts, or by suddenly bending or rotating the trunk, or when lifting heavy bodies. This form of the disease may also commence in the ligaments covering the bodies of the vertebræ; and it may be connected with acute or sub-acute rheumatism, especially when commencing in the ligaments, although this is a rare occurrence; but, however occurring or associated, it may extend to the periosteum, the inflammatory products infiltrating the adjoining parts, detaching the periosteum from the bone, and thereby causing caries of the latter; or it may even originate in the intervertebral fibro-cartilaginous substance, and extend to the other structures, more especially to the bodies of the vertebræ.

101. The disease may commence in the centre or in the sides of the bodies of the vertebræ. In this case, the bone is found to have become redder, softer, and more vascular, and less capable of sustaining a superincumbent weight or pressure; and the progress of the disease is generally more rapid than when it begins in the intervertebral cartilage, or in the ligaments. If the disease commences in the membrane covering the upper and lower portions of the bodies of the vertebræ, the attachments between these become weakened, and ultimately destroyed, and the malady proceeds with considerable rapidity. When it originates in the centre or in one side, or anterior part of the intervertebral substance, ulceration frequently follows, or suppuration supervenes from the extension of the inflammation, the matter infiltrating the adjoining tissues, and either causing or extending the caries of the bone. When the disease commences in the centre of the intervertebral structure, a softened, grayish, and brownish state of the structure is observed; and this is followed by ulceration, disease of the bodies of the vertebræ, caries, suppuration, &c. In these cases, the disease of the structure may advance anteriorly, or to either side, and, according to its direction, occasion not only a more or less angular form of curvature, but a lateral curvature also—a circumstance requiring attention in forming our diagnosis and prognosis. Thus disease of the bodies of the vertebræ may be either primary, or the consequence of inflammation, suppuration, and ulceration of the intervertebral substance, and of the ligamentous apparatus of the column.

102. *D.* Tubercular disease of the bodies of the vertebræ occurs either as an infiltration of the cancellated structure with tubercular matter, or as an agglomeration of the matter into masses, which are surrounded by a cyst or envelope; this latter being more frequent and most manifest. In these cases the tubercular masses undergo similar changes to those observed in the lungs; and as they pass from a crude to a softened state, excavation and ulceration of the containing or surrounding parts takes place, until the vertebra is nearly reduced to a shell, or is formed into several cells, and becomes crushed under the superincumbent weight, the spinous processes of the diseased vertebræ, which at first were merely tender and prominent, rapidly becoming angular, and passing from an obtuse to a more acute form. As soon as the curvature presents a sharp or angular projection, destruction, or loss of substance of a part of one or more of the bodies of the vertebræ, may be inferred. The resulting deformity will depend upon the portion of the spine affected, and the extent of destruction which has taken place.

103. ii. The Symptoms and Diagnosis of this state of spinal disease are extremely delusive at an early stage, and before curvature becomes manifest; and it is still more difficult to determine, even at any stage of the complaint, in many cases, whether the malady results from inflammatory action, or from tubercular deposition, or from both, either having been the primary change. A knowledge of the constitution or diathesis of the patient, of the causes which have produced the disease, and of the whole history of the case, will often throw considerable, or even sufficient, light on its nature; but these data may be wanting, and the only information which can be obtained may be afforded only by the existing state of the patient, or even by the angular distortion demonstrating more or less destruction of the bodies of the vertebræ. While the scrofulous diathesis, and the stealthy progress of the affection, indicate tubercular deposits as the cause in the one case, the previous occurrence of injury, and the absence of the scrofulous taint, will suggest inflammatory action in the other; and, when viewed in connexion with more or less pain, and with the other symptoms, will often evince the nature of the mischief, even before it has advanced to angular projection. Pain is not, however, a constant symptom, even in the more inflammatory state of the disease, especially at an early stage, and often it never amounts to more than an aching; while in the scrofulous form pain may not be much complained of, unless on some occasions. As the disease advances, pain is either more constant or more severe, especially in certain postures, or when rotating or bending the spine, and it is attended by a sense of con-

striction and pain in the base of the thorax and epigastrium, or in the abdomen, according to the part of the spine affected. Even before any marked curvature is detected, this constrictive pain is often felt, and the patient sometimes complains of a grating sensation when turning or rotating the spine, more especially when the disease originates in inflammation of the vertebræ, or of the spinal ligaments. In addition to these symptoms, nausea, vomiting, attacks of pain at the epigastrium, dyspœna, restlessness, costiveness, and evening exacerbations of fever supervene, with increased sensibility of the surface, and cramps, or sometimes numbness of the lower extremities. These may continue an indefinite, but generally a considerable period, the angular character of the curvature becoming more and more manifest. The patient now is generally unable to sustain the weight of the parts above the diseased portion of the spinal column; and he endeavours, when erect, to support himself by leaning upon his elbows or arms, or by placing his hands upon his hips or thighs. He becomes also less capable of walking, his gait being unsteady, shuffling, or peculiar and slow.

104. Whether originating in inflammation or in tubercular deposits in the bodies of the vertebræ, the angular projection of the spinous processes is not very great until caries of the bone and ulcerative destruction of the intervertebral substance have advanced. The loss of structure in a portion of the column, owing to the weight of the superincumbent parts, is attended by more or less distortion, not only of the posterior aspect of the spine, but also of the anterior regions of the trunk. According as the cervical, the dorsal, or the lumbar vertebræ are diseased, the distortion varies remarkably, and as a necessary consequence of the difference in the conformation and attachments of the vertebræ of these regions.

105. *a.* When the *cervical vertebræ* become carious—an occurrence, according to my experience, observed chiefly as a sequela of scarlet fever—the curvature or projection of the spine is not marked; but the neck becomes shortened, drawn somewhat to one side, and is moved with great pain. Partial or incomplete paralysis, chiefly of motion, is often experienced, and frequently increases or passes into general palsy, terminating in asphyxia. Yet I have seen cases in which anchylosis took place, the recovery being complete and permanent, the neck being only shortened and rendered stiff, the head being generally turned somewhat to one side.

106. *b.* When the *lower cervical* and *upper dorsal vertebræ* sink from loss of structure, the chest is flattened, the sternum is drawn inward and downward, and the patient generally experiences difficulty of breathing, owing to the impaired action of the scaleni and other respiratory muscles. The depression of the chest anteriorly is often very great in these cases. When the middle or lower dorsal vertebræ are diseased, the chest is either flattened anteriorly or in a lateral direction, one side falling inward more than another; or either side may be compressed while the other projects; or both sides may be flattened, and the sternum pushed forward. The thorax always approaches very close to the pelvis, and the abdomen is much shortened. The distortion varies much with the seat and extent of caries; and, according as either side of the vertebræ is more affected than the other, the posture most commonly assumed by the patient, and found most easy, also influencing the form of distortion.

107. *c.* When the *lumbar vertebræ* are diseased, the lower or floating ribs are sunk inward and downward, and sometimes even below the crests of the ilium. The abdominal regions fall inward, and are much diminished in their vertical direction. Owing to a greater or less amount of caries in one side of the vertebræ than in the other, or to continuing a certain posture in preference to any other, or to spasm, or permanent contraction of certain muscles, more or less of lateral curvature may be associated with angular projection of the spine, the caries being the cause of both the forms of curvature. When these cases terminate favourably, or when anchylosis takes place, this associated form of curvature may exist to a greater or less extent, and even be attended by some degree of twist, or contraction of the trunk to either side.

108. iii. The Consequences, Complications, and Terminations of angular projection or curvature of the spine are: 1st, changes in the tissues external to the spinal column, or in its vicinity; 2d, changes in the structures lodged in the spinal canal, and in the nerves issuing from the canal; and, 3d, alterations of a restorative nature in the seat of the disease.

109. (*a*) When inflammation, ulceration, or caries exists in one or more of the vertebræ, the usual products of these changes frequently contaminate the adjoining cellular tissue, induce inflammatory action, and give rise to purulent formations, which pass in various directions, according to the peculiarities of the case, ultimately pointing externally, or even internally, at a distance from the original seat of disease, as fully shown when treating of *symptomatic abscess*. (See *art.* Abscess, § 24, *et seq.*)

110. (*b*) Although inflammation or caries of one or more of the vertebræ often exists without implicating the spinal cord or its membranes, or even the nerves proceeding from the canal, nevertheless the membranes are often affected, a chronic form of inflammation being developed, which may be followed by effusion of lymph, and by consecutive changes in the cord, or in the roots of the spinal nerves. When the membranes or cord are thus implicated, the symptoms about to be described, as indicative of inflammation of these parts (§ 120, *et seq.*), are observed, and are usually followed by incomplete or complete paraplegia, and often by the extension of the morbid action along the spinal membranes to the base of the brain, occasioning general paralysis, delirium, coma, and death. But, independently of any affection of the cord or of its membranes, the nerves may be subjected to pressure, owing to the attendant swelling of the parts surrounding their exits from the spine, or to the destruction of parts in the progress of caries. If the pressure be slight, or if it occasion merely irritation of the nerves, severe or neuralgic pains in the course or terminations of the affected nerves, or cramps of the muscles supplied with them, will be experienced; but if the pressure be greater, paralysis of motion, or of sensation, or of both, will be present. Thus, owing to consecutive affection—to the consequent congestion, irritation, or inflammatory action, tumefaction, effusion, and pressure, implicating the membranes of the spinal cord, the origins of the spinal nerves, and even the cord itself, pain, spasm, paralysis, &c., super-

vene and complicate the disease of the vertebræ; and, with or without either of these states of associated disorder, suppuration not infrequently takes place in the adjoining cellular parts, and purulent collections form, and often extend to considerable distances from the seat of caries (§ 109). In most cases, pain of a severe form is experienced in the seat of lesion, and even still more severely in the lower extremities, while the urinary functions are often more or less disordered.

111. (*c*) When the destruction of one or more of the vertebræ has proceeded to an indefinite extent, a reparative process—*anchylosis*—often commences, owing to a salutary change in the constitution of the patient, produced either by an improvement in the diet, or in the air, or by a judicious treatment; and a matter is exuded which becomes the seat of an osseous formation, cementing the adjoining vertebræ, and often partially filling up the spaces left by the destruction of the bodies of one or more of the diseased vertebræ. In these cases, the intervertebral and cartilaginous portions of the spine which have been destroyed are not restored, the osseous formations extending, without loss of continuity, but with varying grades of thickness, from the adjoining healthy vertebræ.

112. iv. The Duration and Prognosis of caries of the vertebræ may be inferred from what has been already advanced. The *duration* of the malady is rarely less than two or three months, and it may be as many years. The *prognosis* depends much upon the habit of body and previous health of the patient; also upon the presence of suppuration, or of paralysis, or of both. Matter often forms and collects near the column, especially its anterior surface; and, in the more favourable of these cases, opens externally, the track of the matter being sometimes very long, and the external opening distant from the diseased vertebræ. The carious destruction may, even in some of these cases, be repaired by anchylosis and by the column falling together at the angle corresponding to the quantity of substance lost; but much more frequently the disease exhausts the patient, the symptoms usually showing that the spinal cord and its membranes suffer more or less. Thus the cord itself may be compressed by tumefaction of the ligamentous apparatus, by the irruption of an abscess into the canal, by dislocation of fragments, or of the whole, of a vertebra, or by the products of circumscribed inflammation of the dura mater of the cord; or it may be bent, pressed upon, or irritated at the spot where the angular projection is commencing; or it may waste, or circumscribed inflammation may take place in it, or diffused inflammation in its membranes. When the upper dorsal vertebræ are carious, the abscess sometimes opens into the thoracic cavity, or into one of the bronchi, and matter and necrosed or carious fragments of vertebræ are discharged through the air-passages. Caries of the abdominal part of the column is very often complicated with what is commonly called *psoas abscess*.

113. The prognosis may be farther directed by the following symptoms: if a scrofulous or syphilitic taint exist; if the constitutional or vital powers be much depressed; if symptoms of inflammation of the membrane appear; if palsy, or even cramps, supervene; and, more especially, if the palsy extends; if febrile symptoms with delirium are present; and if the urinary functions are much disordered, an unfavourable opinion of the issue should be entertained. On the other hand, if the general health be not greatly impaired; if the several excreting functions are not materially affected; if sensation and motion are not disordered; if pain or constriction is not present, and if the digestive and assimilative functions are not much disturbed, more or less complete restoration to a healthy state, by means of anchylosis, may be expected.

114. v. Treatment.—The means of cure should depend chiefly upon the causes and circumstances originating the disease. If inflammatory symptoms be present at an early stage—if these have followed a blow, sudden jerk, or injury of any kind; and if constriction, severe pain, increased by motion, be complained of, the application of leeches, or of cupping-glasses, near the seat of pain, will generally be serviceable. These may be followed by a terebinthinate embrocation or by a blister, the latter being applied considerably below the seat of the disease; or the blister may follow several applications of the embrocation, or it may be kept discharging for some time. These means, however, ought to be employed, or persisted in with due caution, and a careful observation of their effects.

115. If the disease appear independently of any injury, violent exertion, or inflammatory cause; if it come on in a gradual or stealthy manner; if it occur in a scrofulous, cachectic, or syphilitic diathesis or taint; if the patient feels a grating sensation when rotating the trunk; and if indications of purulent formations in the vicinity, or of a symptomatic abscess, are present, neither leeches, nor cupping, nor blisters, will be of any service; they will much more frequently be prejudicial. In these forms and states of the disease, such means as will remove the weight of the upper parts of the frame from the diseased vertebræ, and promote vital resistance to the extension of the disease, and improve the digestive, assimilative, and excreting functions, have been found most beneficial in my practice—even in some cases of great and almost hopeless severity. A combination of these, with such as more frequently produce an alterative influence upon the capillary circulation, more especially with the preparations of iodine, or with the bichloride of mercury, or with the solution of potash, or Brandish's alkaline solution, ought always to be preferred. I have often found that a change from a course of some continuance of the one, to that of another form of combination, has been of manifest benefit—that the exhibition of the bichloride, in the simple or compound tincture of cinchona and fluid extract, or concentrated compound decoction of sarza, for a longer or shorter period, according to circumstances, followed by the compound tincture of iodine, or the iodide of potassium, with Brandish's solution, or the carbonate of potash, and the other preparations just mentioned, has been of very essential benefit.

116. When the inflammatory form of the disease has gone on to the production of caries, or to suppuration, and in the scrofulous, syphilitic, or rheumatic states, the above means are most deserving adoption, and may often be aided by the application of the liniment already prescribed (§ 54) along the spine, or of some one of the

other terebinthinate liniments prescribed in various parts of this work, as well as in the *Appendix*. When the disease is attended by anæmia and much debility, then the preparations of iron, especially the iodide of iron, should be given in sirup or sarza, or in other suitable forms. In the several scrofulous states of the disease, the means advised for the treatment of Scrofula (§ 172, *et seq.*) will be of more or less service. The propriety of having recourse to issues, or setons, or moxas, or other forms of derivation, has been a subject of discussion. Pott recommended issues on each side of the projecting spinous processes, and the practice has been very generally adopted since his time, with apparent benefit in some cases, and with no advantage in others. Sir B. Brodie, an authority of the greatest weight, states that he has seen no benefit result from the use either of these or of blisters. There can be no doubt that they are not so generally, or even so often beneficial, as they were formerly believed to be, and that an indiscriminating recourse to them is as frequently injurious as beneficial; but if due regard be paid to the form, state, or progress of the disease, they will often be of service; if, however, caries be extensive ; if it be attended by anæmia, great emaciation and debility ; if the digestive, assimilating, and excreting functions be much impaired; and if the medicinal and regimenal treatment be not prescribed appropriately to the state and peculiarities of each case, these and similar means will not only entirely fail, but will even accelerate a fatal issue, by lowering still farther the already depressed condition of vital power, and by increasing the extent of caries, or the amount of suppuration, or of vascular contamination. I have usually had recourse to these means only after inflammatory symptoms have been combated as far as circumstances permitted, and when the contra-indications to their use were not present; and during their employment I have advised the tonic and alterative treatment already mentioned (§ 115, 116), with due attention to diet, change of air, &c.

117. While duly regulated modes of *exercise* are beneficial in other kinds of curvature, perfect *rest* is requisite in this; but rest should be aided by a wholesome air and a well-ventilated apartment. The use of those couches which facilitate the *prone* posture should be adopted; and, while all measures which forcibly extend the spine and risk injury to the structures contained by or adjoining the diseased vertebræ, ought to be avoided, the position chiefly maintained should, as much as possible, be such as will prevent the increase of curvature. This is as much as may be expected from couches merely; but, either with or without these, the avoidance of all motions of the vertebræ—either of flexure or rotation—ought to be studied. Forcible extension of the flexed portion, or forcible depression of the projection, may injure the early reparative changes of the diseased parts, by which anchylosis and a restoration to a comparatively healthy state are effected.*

118. The consecutive disorders (§ 108–111), especially symptomatic abscess and paralysis, which often complicate angular curvature or caries of the spine, caused either by inflammation or scrofulous disease of the vertebræ, should be treated conformably with the views above exhibited, but appropriately to the stages and states of each case, and to the particular disorders which have been thus superinduced. As to the additional means which these latter require, I must refer the reader to what has been fully stated respecting them when treating of *symptomatic abscess* (*see* Abscess, § 62, *et seq.*), of *Paralysis* (§ 204, *et seq.*), and of *Spasm* (§ 313), where such measures as are most suitable to each of these associations are described.

119. VII. Inflammation of the Membranes, and of the Spinal Cord.—Synon.—*Rachialgitis*, J. Frank. *Rachialgia Inflammatoria—inflammation commencing in, or extending to, either the spinal cord or its membranes, or both.*

Classif.—III. Class, I. Order (*Author*).

120. Definit.—i. *Pain in the spine, often acute, with or without rigours, commencing with increased sensibility of the surface of the body, and symptomatic fever, followed by spasms, cramps, constriction, &c., especially on motion, passing into palsy, usually in the form of partial or complete paraplegia, or general paralysis, with interrupted or disordered excretion.*

121. ii. Pathol. Definit.—*Inflammation occurring primarily in, or extended to, either the dura mater, or arachnoid, or pia mater of the cord, or the spinal cord itself, and generally implicating two or more of these, followed by thickening, effusions, adhesions, disorganization, &c.*

122. The diseases of the spinal cord, whether inflammatory or structural, present numerous analogies to those of the brain, not merely in their natures, which are frequently identical, but also in the phenomena to which they give origin. My friend, Dr. Wood, of Philadelphia, justly remarks in his very excellent work, that there is in both brain and spinal marrow the same liability to inflammation of the membranes and the nervous matter, to derangement from non-inflammatory organic affections, including hæmorrhagic and serous effusion; and these different affections in the one are not infrequently merely extensions of the same affections in the other. Like the brain, too, the spinal marrow contains nervous centres and conducting filaments, and it may suffer disease in these constituents separately or conjointly.

123. The spinal cord discharges certain offices, a knowledge of which is necessary to the diagnosis of its diseases. 1st. It receives impressions from other parts of the body, and transmits influence to these parts, either independently of the brain, or with the due exercise of the functions of the brain; 2d. It conveys influence to and from the brain; 3d. It is the medium by which impressions or influences are often conveyed from the ganglial centres to external and voluntary parts, and from the latter to the former.—(*a*) According to its *first* office, it aids the ganglia in the discharge of their functions, and re-enforces their energies; while, on the other hand, the ganglial influence is extended to it, by means of communicating or anastomosing branches. Hence, lesions of the cord or of its membranes very manifestly affect respiration, assimilation, secretion, excretion, and reproduction.—(*b*) Conformably with its *second* office, voluntary motion or sensation, or both, are interrupted, or disordered, or perverted, when either the spinal marrow or its

* I have great pleasure in referring the reader to what Mr. Bishop has stated on this subject, in his very able and philosophical work on Deformities of the Human Body, which appeared as this sheet was passing the press.

membranes are diseased.—(*c*) And, according to its *third* office, irritation or other affections of internal viscera, digestive, excreting, and reproductive, are frequently transmitted to external, distant, and voluntary parts, and from these latter to the former, as illustrated by the origins and courses of many diseases.

[It is now pretty well established that the spinal cord is neither a mere collection of tracts of nerve-fibres, nor a single nervous centre, but a collection or series of *central stations*, each of which has its own lines of nerve-fibres terminating in it, and serves to receive and to transmit, on numerous lines and in various directions, the impressions which are conveyed by the centripetal nerves abutting on it.]

124. It is manifest that the amount, as well as the character and seat of disorder, will vary remarkably with the particular structure inflamed, or otherwise diseased, and with the situation of the diseased part in the spinal canal, or with the extent of it along the cord. In estimating, therefore, the seat and nature of the malady indicated by the symptoms, certain pathological conditions should be kept in recollection: 1st. Disease or injury of the vertebræ, or of the intervertebral substance, or of the ligamentous apparatus, may, by irritation or pressure, more or less interrupt, disorder, or pervert the functions discharged by the spinal cord. 2d. The products of congestion, or of inflammation of the membranes, may, by irritation or pressure, exert a similar influence, in respect of the offices of the cord, independently of any actual or manifest disease or change in it. 3d. That inflammation, aided by its usual products, may, on the one hand, extend not only to two, or to all the membranes, but also to the substance of the cord itself. 4th. That inflammatory or other lesions of the cord itself may, on the other hand, extend to one or all its membranes. 5th. That this extension of the disease to the several structures is more frequent than the limitation of it to one only; and the extension of morbid action, more or less, along the spinal membranes and cord—or even to the base of the brain—is much more common, especially in very young subjects, than the limitation of it to a part only. 6th. That the extension and diffusion of inflammation is more rapid and general in the membranes than in the substance of the cord; and more so in delicate, scrofulous, and cachectic habits than in the robust and healthy. 7th. That, as far as my own experience enables me to judge, the extension of meningitis spinalis upward to the brain is much more frequent than the extension of it downward along the spine; and the latter mode of extension, as well as the complication of spinal meningitis with cerebral meningitis, is most frequent in very young and delicate children, and in cachectic and broken-down constitutions.

125. Although inflammation of the membranes is often associated with inflammation of the substance of the spinal cord, the disease commencing or predominating in either, still the one or the other may be separately, solely, or chiefly inflamed; and hence it is in some measure requisite to consider the phenomena which more especially belong to each, and which indicate a more prominent affection of one structure than of the other, when they are all more or less implicated. I shall, therefore, first notice inflammations of the membranes, and next inflammation of the substance of the cord.

126. i. Inflammation of the Membranes of the Spinal Cord.—Synon.—*Meningitis spinalis* — *Arachnitis spinalis* — *Meningite spinale*, Fr. *Spinal Meningitis*.

127. Definit.—*Acute pain in the course of the spine, with or without rigours, attended by increased sensibility of the surface of the body, by symptomatic fever, by tonic spasms, especially on motion, followed by palsy, and often by delirium and coma.*

128. Although either of the membranes of the spinal cord may be primarily, or even separately and solely inflamed, yet the symptoms which more especially belong to the affection of each—which indicate either their separate or conjoint disease—cannot be distinguished in such a manner as to justify an attempt to form a diagnosis between them. That these membranes may be separately inflamed, although their conjoint affection is much more common, is often rendered manifest by the appearances observed after death, the pia mater displaying most frequently and most evidently the changes characteristic of inflammatory action.

129. *a.* The *dura mater* of the spinal cord is very seldom inflamed, unless as a consequence of injuries of the spine and disease of the vertebræ. In rare instances, however, I have found it inflamed in connexion with acute rheumatism, the usual changes consequent upon inflammation of the membrane, and of fibrous tissues in general, namely, exudation on the inner free surface, thickening, and adhesion to the arachnoid, having been found after death.

130. After injuries and caries of the vertebræ, local or circumscribed inflammation of the dura mater has occurred. In these circumstances, effusion of fluid has been seen exteriorly to the membrane, or between it and the bodies of the vertebræ, with or without exudations from the arachnoid lining the dura mater, &c. These changes have been described by Bergamaschi, Lallemand, Ollivier, myself, and many others.

131. *b.* The *spinal arachnoid*, especially in its visceral layer, forms a sac, which does not adhere closely to the pia mater, as it does within the cranium. The visceral layer, and the sac within it, are the seats of the most serious lesions of the inner membranes of the cord—of both the *arachnoid*, and of the *pia mater* of the cord. Inflammation of the arachnoid—*arachnitis spinalis*—is rarely observed without inflammation of the *pia mater* of the cord, and the vascularity is much more manifest in the latter membrane than in the former. There is, however, one change often seen in the arachnoid alone that may be viewed as a consequence of repeated or protracted congestions, or of slight attacks of inflammation. This consists of dulness, opacity, and thickening of the arachnoid, and is usually combined with chronic effusion of serum into its sac, especially the inner sac. Adhesions between the arachnoid and dura mater are rarely seen, unless as a consequence of injuries.

132. *c.* Inflammation of the *pia mater* of the cord (*meningitis spinalis*) may occur spontaneously or primarily, but it is most commonly connected with inflammation of the other membranes—frequently a consequence of inflammation of one or both, and is generally occasioned by external injuries. Spontaneous inflammation of the pia mater of the cord is often associated with cerebral meningitis, and is then especially

extended along the spinal cord. This complication is most frequent in infancy and early childhood. Inflammation of the pia mater is also commonly associated with inflammation of the substance of the cord with *myelitis*. I shall first notice acute spinal meningitis, subsequently the chronic states of the disease, and, lastly, the complications which spinal meningitis often presents in practice.

133. *A.* Acute Spinal Meningitis.—*a.* Acute inflammation of the membranes of the cord, when occurring as a *primary and uncomplicated malady*, generally commences with pain or soreness in the spine, with chills or rigours, and increased sensibility of the surface of the body. In other cases the attack is more sudden and violent, with a sense of heaviness, pain, or uneasiness in the extremities. The pain is severe, and, although beginning in a particular part or region, generally extends more or less along the spine. The cervical region is most frequently attacked, especially in children, but the situation first affected depends much upon the cause in relation to the portion of the spine on which it acts. The pain is not confined to the spine, for all parts of the frame supplied with nerves proceeding from the portion affected, or its vicinity, are more or less subject to neuralgic pains or uneasiness, tingling, and formication, accompanied with spasms, and with constrictions around the corresponding parts of the trunk. These symptoms are always increased on motion, and in infants on their being moved, and when lying on the back on a warm bed.

134. When the cervical portion of the membranes is most affected, trismus, spasmodic retraction of the head, and tonic spasm of the spinal muscles, contraction or spasm of one or both arms, and twitchings or convulsive movements of the lower limbs, are commonly present. When the dorsal or lumbar portions are chiefly affected, painful constriction of the thorax or abdomen, increased pain on motion, with the other symptoms already mentioned, are present. In extreme cases the spasmodic contractions of the dorsal muscles recur, or are exacerbated at intervals, and give rise to attacks of opisthotonos. Although the lower extremities are affected by pain, cramps, or clonic spasms, and are more or less enfeebled, the power of voluntary motion is not lost at an early stage, but it becomes much impaired, and ultimately abolished at an advanced period, and when the disease is not arrested in its usual course.

135. Febrile symptoms are always present; the pulse is hard, frequent, and constricted, or sometimes small; the heart's impulse is increased; the skin hot, acutely sensitive, sometimes perspiring freely; respiration is laborious, anxious, suppressed, or painful; the bowels are constipated; and the urine is suppressed or retained.

136. The above symptoms remit and recur at intervals, but they rarely intermit; and if the course of the disease be not arrested, they return with greater violence, the local symptoms evincing the extension of the disease along the spine, if it have commenced in any part of the column, until the paralytic affections become more and more general or complete, and until drowsiness, lethargy, or delirium; irregularity, smallness, or slowness of the pulse; involuntary evacuations, retention or incontinence, or alteration of the urine, and ultimately either asphyxia or coma, or both, supervene, and indicate the extension of the disease to the base of the brain, as well as the more or less complete abolition of the functions of the cord, by the products of inflammation of its membranes. A fatal issue may take place in four or five days, or from that time to two or three weeks from the commencement of the attack.

137. *b. On examination after death*, the dura mater is generally found of a deeper colour than natural. The arachnoid is duller, more opaque, and somewhat thickened. The pia mater is reddened, injected, and swollen, especially in its posterior aspect. Fluid is effused between the membranes, especially between the pia mater and arachnoid, which is sometimes turbid, but more frequently coagulated, or in the state of coagulated lymph, or a purulent matter, occasionally mixed with a turbid serum or lymph, is sometimes met with. These changes may be limited to a portion of the cord, but they are more frequently extended more or less along it. The substance of the cord is often more vascular than natural. It is sometimes less vascular and firmer than usual, probably owing to the pressure occasioned by the effused fluids. It is not softened, unless the inflammation has extended into it.

138. *c. The association of spinal meningitis with cerebral meningitis — acute cerebro-spinal meningitis*—is more common than uncomplicated spinal meningitis, especially in infants and children. The disease may commence in either the spine or within the cranium, and extend more or less rapidly from the one to the other. It rarely occurs coetaneously in both. According to my experience, it most frequently commences in or near the base of the brain in children, extending downward; and oftener in the spine in adults, advancing upward to the brain. It has been observed, in both endemic and epidemic forms, in some parts of Ireland and France; and Dr. Wood refers to Drs. Hicks, Taylor, and Ames, who have described its occurrence in these forms in some districts of the southwestern states of North America.

139. *Cerebro-spinal meningitis* commences, in the milder cases, with general uneasiness, a sense of fatigue, headache, pain in the neck and back, extending often along the spine, stiffness of the jaws, difficulty of deglutition, constipation, and retention of urine, or difficulty of micturition. As the disease advances, headache becomes more violent, and is attended by great sensitiveness of light and sound, by rigid spasms, retraction of the head and neck, acute sensibility of the surface of the body, by increased rigidity of the trunk, or cramps of the extremities on motion, and by convulsive movements of the limbs. The febrile excitement is great; the pulse is very frequent, constricted, or small; the skin is hot, thirst is urgent and constant, delirium supervenes, and is often preceded by vomitings.

140. In the severest attacks, chills or rigours, attended by severe pain in the abdomen and spine, and by vomitings and purging, are followed by reaction, and by all or most of the symptoms now enumerated in a more violent form. If the disease be not early arrested by treatment, more or less general paralysis and coma soon follow the above symptoms, and death ensues. The disease may run its course in forty-eight hours, but it much more frequently continues for six or seven days, and sometimes it may be prolonged to two or three weeks.

141. *d. On dissection*, the morbid appearances are said to have been comparatively slight in some of the endemic or epidemic cases, vascularity and effusion not having been great, although more or less general, and the substance of the brain and cord not sensibly altered. More frequently, however, the changes have been remarkable, especially an effusion of greenish or yellowish lymph between the arachnoid and pia mater, which was scanty or nearly absent on the cerebral hemispheres, but much more abundant at the base of the brain and in the spinal column, either investing the cord completely, or somewhat more abundant on its posterior aspect. It has sometimes extended along the whole cord to the extremity of the caudex equina, coating even the roots or commencement of the spinal nerves. This morbid exudation has not been found in the external sac of either the cranial or the spinal arachnoid.

142. *B.* Chronic Spinal Meningitis.—Chronic inflammation of the membranes of the spinal cord has hitherto been very imperfectly described and illustrated, and, as far as my own experience warrants the statement, it is certainly not so rare a malady as stated by several recent writers. It may occur as a consequence of an acute or sub-acute state of spinal meningitis; but I have observed it much more frequently as the primary disease, upon which an acute or sub-acute state supervened sooner or later, or as the disease extended upward to the medulla oblongata, or base of the brain. The earliest account of a case of chronic spinal meningitis, with the appearance after death, was recorded by myself in 1820; and since then I have seen a considerable number, and examined the bodies of several of them.

143. While the morbid appearances in the cases of acute spinal meningitis have been such, as far as I have observed them, as to indicate the chief seat of morbid action to have been the inner sac of the arachnoid, or between the arachnoid and pia mater, the changes in chronic spinal meningitis have shown the external cavity or sac to have been their principal or only seat, effusion of coagulable lymph between the arachnoid of the dura mater and the visceral arachnoid obliterating the cavity by adhesions of the opposite surfaces by this medium. This diversity may depend upon the circumstance of the disease assuming not only a more acute, but a more rapidly diffusive character when the inner arachnoid is attacked, or when the fluid is effused between the arachnoid and pia mater, than when the disease commences, as it probably does in chronic cases, either in the dura mater or on the arachnoid covering it. Chronic meningitis may follow the acute form, or be produced by any of the causes about to be assigned.

144. *a.* The *causes* of chronic spinal meningitis are the causes of spinal maladies generally (§ 16, *et seq.*), but they are more especially blows or falls on the spine, particularly on its lower regions; currents of cold air, after having been overheated, directed on the spine; sprains or bruises of the column; sleeping in damp beds or upon the ground; the abuse of alcoholic liquors; venereal excesses; the extension or metastasis of rheumatism to the membranes and ligaments of the spine; the congestion of the spinal membranes during continued and eruptive fevers; caries of the vertebræ; and various organic changes implicating the cord or the membranes.

145. *b.* The *symptoms*, especially the initiatory symptoms, vary much, according to the cause, to the temperament, habit of body, and age of the patient, and to the region of the spine primarily affected. Whatever part may be first attacked, the tendency to spread, or to extend upward, as well as downward, should not be overlooked; for, although this tendency is not nearly so remarkable as in acute spinal meningitis, yet it exists more or less. It may not be remarked for months, or even for years, in the more robust and otherwise healthy subjects, the patient hardly presenting any increase of ailment, or even becoming greatly relieved; but more frequently, especially in delicate or cachectic persons, or during an injudicious treatment, the symptoms extend and become aggravated, more or less rapidly, and either pass into a sub-acute or an acute state, or indicate the extension of the inflammatory action to the base of the brain. This aggravation and extension of the malady are favoured by a recurrence of the causes which first induced it, by mental perturbation, by physical exertions, attended by sudden or frequent movements of the spine, by measures which lower the powers of life and of vital resistance, by imperfect attention to the digestive, secreting, and excreting functions, &c.

146. Chronic spinal meningitis generally comes on slowly and insidiously; and, owing to many of the most severe symptoms being experienced in parts far removed from the spine, it is often, at early periods of its course, mistaken for chronic rheumatism, for neuralgia, or for simple weakness of the limbs, or even for atonic gout. As it proceeds, it may be viewed as a form of rachialgia or spinal irritation, or as an attack of chorea, either of which may be followed by, or pass into, chronic spinal meningitis at some period of their course, even if they should not prove identical with the early progress or commencement of chronic inflammatory action in the spinal membranes, or with congestive states of these membranes, upon which the inflammatory may supervene.

147. The patient complains of aching, or of dull pains in some part of the spine, generally connected with pains in the nerves or in their extremities, corresponding with the part of the spine affected; or with pains in the extremities; or with formication, tinglings, prickings; or with a combination of these, with some degree of numbness in the lower limbs. The pain in the lower extremities is sometimes most poignant, especially in certain positions or movements; is occasionally absent, or intermittent, or remittent; and is succeeded during the intermissions by uneasiness in various forms. The gait of the patient becomes now weak, unsteady, and tottering. He moves with difficulty or uncertainty, and staggers or straddles when he attempts to walk. If the disease extends to the dorsal and cervical regions of the cord, a similar difficulty and irregularity of motion are observed in the hands. The fingers imperfectly perform their office; their motions being irregular, slow, and difficult, and articles being held by them awkwardly and insufficiently. The movements of the arms are irregular or in jerks, so that the patient is either nearly or altogether incapable of feeding himself. He may continue in this state for months, or even years. One gentleman whom I attended was nearly as now described for seven or eight years, experiencing various exacerbations, but always suffering more or less, the disease having all this time affected

the whole spine to above the nape of the neck, and being attended, as it usually is, by spasmodic contractions in various muscles, and distressing constrictions around the abdomen and thorax. During this state of the malady, flatulence of the stomach and bowels, anorexia, costiveness, or marked irregularity of the bowels, incontinence of urine, dryness of skin, or occasional sweats, and aggravation of the symptoms during the night, or when warm in bed, are more or less experienced.

148. During the progress of the disease, the pulse may not be materially affected, especially when the lower regions of the cord are chiefly or solely affected. But when the membranes of the cervical portion of the spine are attacked, the pulse is often very slow, and the actions or impulse of the heart disordered. Palpitations are frequent when the dorsal region is more acutely implicated. Difficulty of deglutition, slowness or irregularity of respiration, spasm of the muscles of the neck, with paralysis of one or both arms, or irregular motion or contractions of the arms, often supervene, particularly as the disease extends upward to the cervical membranes. Ultimately the paralysis becomes complete, especially the power of motion, at first in the form of paraplegia, and if not arrested, passes into incomplete or complete general *paralysis* (see that *article*, § 69, *et seq.*) With the progress of paralysis, impaired animal heat and nutrition, a disposition to form gangrenous sores in parts pressed upon, and the several phenomena described under that head, supervene. At last the lesion of the membranes extend to the medulla oblongata and base of the brain, and life is terminated by asphyxia, or more slowly by coma, supervening on delirium. In some cases the chronic affection of the lumbar or dorsal spinal membranes, after a protracted continuance, or even after a marked improvement of all the symptoms, is unexpectedly followed, or after evident causes, by an acute attack, extending upward to the cervical region, or to the base of the brain, and more or less rapidly causing dissolution. Of this course of the malady I have met with several instances. A few of these have been noticed under the article Paralysis, in the chapters on *Paraplegia* and *General Paralysis* (§ 48–74); others have occurred to me since that article was written.

149. *c. Chronic Spinal Meningitis following the acute.*—A medical friend was driven, after having been overheated, during a cold night, to some distance in an open carriage. He was soon afterward seized with pain in the lower dorsal and lumbar muscles, and with most acute pain and cramps in the lower extremities. I did not see him until several weeks after the commencement of this acute attack. He then complained of extremely severe rheumatic pains in the lower limbs, with increased sensibility of the surface, a nearly total loss of motion of the lower extremities, of tenderness on pressing the spinous processes of the upper lumbar vertebræ, of a girding sensation proceeding thence around the abdomen, with occasional cramps and paroxysms, of pains in the thighs, legs, and feet. His bowels were costive; his urine was voided regularly, but it contained much of the phosphates. The disease was viewed as acute rheumatic inflammation of the membranes of the cord, which had passed into a more mitigated and chronic form; and it was inferred that coagulable lymph was effused between the membranes, the patient having continued paraplegic. Another medical friend, whom I soon afterward attended for some time with Dr. Watson and Sir B. Brodie, was similarly attacked. The urine was freely voided, but it abounded with the phosphates. In the course of our attendance, inflammation of the femoral veins supervened. This complication was, however, overcome; but the spinal disease became chronic. This case was also caused by exposure to cold after being overheated, and was viewed as rheumatic.

150. *d. Chronic Spinal Meningitis; Lymph between the Membranes, partially converted into adipose Substance.*—A female, aged about 50, very corpulent, complained of pain in the dorsal spine, and loss of the power of motion in the lower extremities, with tenderness on firmly pressing on the spinous processes of the lower dorsal vertebræ and with spasms of the muscles of the lower limbs. The loss of motion was gradual, was preceded by spasms and increased sensibility, and was more complete in one limb than the other, but it slowly became complete in both. There was no loss of sensibility. The bowels were costive, the urine was sometimes retained, but subsequently was often passed involuntarily. A distressing feeling of constriction around the abdomen was complained of. After some months the voluntary motions of the lower extremities partially returned, and the excretion of urine was more under command; but some time afterward the pain in the spine extended upward, the constriction being then referred to the thorax. One arm soon afterward became partially paralyzed, and she soon afterward died of asphyxia. She had imputed her attack to exposure of her back to a current of cold air when insufficiently clothed; but her habits were very intemperate. On examination after death, the venous sinuses of the vertebral canal were remarkably congested with black semifluid blood. Coagulated lymph, partially organized, was effused between the dura mater and visceral arachnoid; and the more organized portions presented an adipose appearance, from the quantity of oil-globules they contained. The upper portion of the cord and medulla oblongata were very vascular, and surrounded by a turbid serum and recently effused lymph.

151. The inflammation in this case, after being limited for many months, in a chronic form, to the membranes of the lumbar and dorsal portions of the cord, ultimately extended upward in a more acute form to the membranes of the cervical medulla and the medulla oblongata, the effusion of lymph from the inflamed and congested membranes in these latter situations having been the more immediate cause of death. The oleaginous change, or approach to a fatty degeneration of the more organized portions of the coagulated lymph observed in this case, was still more remarkable and complete in the following.

152. *e. Chronic Spinal Meningitis supervening upon prolonged Jaundice; Lymph effused between the Membranes, and converted into a soft, adipose tissue in the dorsal and lumbar Region.*—A lady, aged about fifty at her death, was attended by Dr. King, of Eltham, and the author, for jaundice, which had continued for several years without having been materially influenced by treatment. She had, however, retained her strength, flesh, and spirits, and was able to go abroad daily, until nearly a twelvemonth before her death, when she gradually lost the motive power of her lower ex-

tremities, sensibility having been unimpaired. She had, previously to, and about the accession of the palsy, complained of pain in the lower dorsal and lumbar spine, with constriction around the abdomen. The bowels were costive, but the excretion of urine was not materially affected. The menses were regular, and continued so up to two or three months before her death. The palsy had continued for many months, with a slight improvement during the latter months, when a few days before her death, and owing to mental and physical perturbation, signs of the extension of the spinal meningitis, in an acute form, to the cervical portion of the cord, and to the base of the brain, appeared, with paralysis of the upper extremities, delirium, and coma.

153. On examination after death by Dr. King, and two other medical men, in my presence, the dorsal and lumbar spinal membranes were found agglutinated by a substance which presented an organization almost identical with adipose substance, but which, as it approached the upper portion of the dorsal region, presented more and more of the characters of firmly coagulated or partially organized lymph; and, in the cervical region, as far as the base of the cranium, the lymph had the usual appearance of recent effusion, and was attended by a considerable accumulation of turbid serum. In this case, as well as in others where I have observed coagulated lymph many months after its effusion between serous surfaces, the conversion of it into an adipose, or rather into a cellulo-adipose tissue—a more or less fatty degeneration of the coagulated or organized lymph—had been effected, this conversion being in some respects a process of reparation, admitting of a partial return of the functions of the diseased parts. (See *Of the Causes, Nature, and Treatment of Palsy and Apoplexy*. By J. Copland, M.D., F.R.S., &c. London, 8vo, p. 60, *et seq.*)

154. ii. Inflammation of the Spinal Cord. —*Myelitis*, from *μυελος, the medulla spinalis*.—*Myelite*, Fr.—*Markentzündung*, Germ:—Inflammation of the substance of the spinal cord may be *acute* or *chronic*, as observed in spinal meningitis, and it may occur primarily and simply, but it is more frequently associated with inflammation of the pia mater of the cord, often extending also to the visceral arachnoid. The frequency of these associations—the extension of the inflammatory action from the one structure to the other—and the circumstance that the disease rarely comes under the eye of the physician until it is advanced in its course, render the early history of myelitis difficult to be described. The older writers on medicine appear to have been unacquainted with this disease; and it is only since pathological anatomy was advanced by comparatively recent inquirers that the diseases of the spinal cord and of its membranes have received any attention, very much still requiring to be ascertained respecting the extent of function and the lesions of this part of the nervous system, and the signs and symptoms by which these lesions are manifested during life. Among the several writers of the present day who have noticed the diseases of the spinal cord, very few have endeavoured to distinguish the symptoms which are proper to inflammation of the cord, from those which more especially belong to inflammation of its membranes; and the signs, which some writers have assigned to the one disease, have been by others attributed to either.

155. *A. Acute Myelitis* commences, with or without chills or rigours, with acute, deep-seated pain in some portion of the spine that is much aggravated by motion. J. Frank, however, says, that he has not observed this exasperation of the pain on motion. I have remarked it, but not always. The patient lies sometimes on the abdomen, sometimes on either side, but he cannot lie long on his back on a soft and warm bed. According to Klohss, this last position may be much longer retained on a hair mattress. The spinal pain is generally more or less limited in extent, and is attended by stupor or numbness, and prickings or tinglings in the corresponding muscles and limbs. The stupor is the more marked the more violent and rapid the inflammation, and the sooner terminates in more or less complete palsy. In some cases the patient cannot move his lower extremities, which are the seats of excessive pains, exasperated most acutely by the slightest contact. M. Ollivier and myself have seen the pain and sensibility so excessive as to render the contact of the bed-clothes unbearable. The retention of the fæces and urine is at first more or less complete, but their involuntary excretion is very common as the disease advances. In rare cases, or when the malady is very rapid, the alvine discharges are involuntary from the beginning. Occasionally, however, constipation continues throughout, and excretion of urine remains under the control of the will.

156. The paralysis consequent upon myelitis sometimes ascends from the lower extremities until it reaches the superior parts of the trunk, and even the superior members, causing death by affecting the respiratory nerves, and producing asphyxia. In rare cases, the disease proceeds in an opposite direction, extending from above downward. In some instances, there is only loss of motion, sensibility being slightly or not at all impaired. In others, sensibility alone is abolished; and in several, there is loss of both motion and feeling to an equal extent. These differences are owing to the parts of the cord affected. It was formerly believed that the anterior columns, presiding over motion, were affected when motion was lost, and that the posterior, presiding over sensation, were affected when sensibility was lost. Several cases, however, recorded by Rullier, Stanley, Webster, and others, prove either that the changes observed in the posterior columns of the cord have taken place at the moment of, or immediately after dissolution, or that sensation may be transmitted through other channels besides these columns, or even independently of the spinal cord itself. But this subject has been sufficiently discussed in the article Paralysis (see § 179, *et seq.*). It may, however, be here remarked, that in the cord, as in the brain, the white or fibrous structure may be more especially connected with motion, the gray structure with sensation and its several manifestations. Usually paralysis commences in a single limb, and afterward extends to the opposite side. Sometimes spasms, contractions, or convulsions of various duration, precede the paralysis. When palsy is complete, the limb is flaccid as well as motionless, but when less so, permanently contracted and painful.

157. Myelitis seldom is seated in the whole extent of the cord; much more frequently in a portion only, the symptoms generally indicating the seat. If it be in the vicinity of the annular pro-

tuberance, disorder of the senses, or furious delirium, or many of the symptoms of inflammation of the brain, and even hydrophobic symptoms, followed rapidly by general paralysis and asphyxia, are often observed. If the cervical portion is affected, there are pains in the neck, and generally rigidity of the muscles of the neck and of the upper extremities, which are sometimes convulsed or contracted, and at last paralyzed. The palsy usually commences in one of these extremities only, and is preceded by numbness and prickings, at first at the points of the fingers, rising gradually thence to the hand, fore-arm, and arm, and is soon replaced by loss of motion, and often also by more complete loss of sensation. Respiration is generally laborious, painful, anxious, and performed chiefly or only by the diaphragm. M. Ollivier and myself have observed difficulty of deglutition at an advanced stage, this function being often painful also, especially when swallowing fluids. Singultus is also sometimes observed.

158. When the inflammation is seated in the dorsal portion of the cord, or between the two thicker portions, giving origin to the nerves of the extremities, then continued or frequent succussions of the trunk of the body, not extending to the limbs, are observed. If the thicker portions of the cord are affected, the convulsive movements extend to the limbs whose nerves originate in these portions. Respiration is short, precipitate, and performed by the diaphragm: there are likewise palpitations, and strong, frequent or irregular action of the heart. To these symptoms, according to the younger Pinel, there are joined a nearly entire abolition of the functions of the nerves originating in this part of the cord, and a state of febrile excitation of the other functions. When the lumbar portion of the cord is affected, spasms or constriction, or contraction of the abdominal muscles, paralysis of the lower limbs, involuntary stools, or retention of the urine and fæces, with deep-seated pain in the lumbar spine, are observed. Sometimes priapism occurs, especially when myelitis is caused by a fall or injury. The *duration* of acute myelitis may vary from three or four days to as many weeks; and various febrile and sympathetic phenomena may attend individual cases; as vomiting, singultus, dyspnœa, delirium, morbid states of the urine, and a disposition to bed-sores, especially in the more prolonged cases, &c. (See *art.* Paralysis, § 64, *et seq.*)

159. *B.* Chronic Myelitis may follow the acute, which, owing to treatment or other influences, may become chronic and slight, or subacute and ultimately chronic; or it may commence in a slight and chronic form, and after an indeterminate period, becomes more or less acute and rapidly fatal. The symptoms are chiefly a less intense state of those characteristic of the acute. There are generally pain, more or less slight or severe, in some part of the spine, and pains or cramps in corresponding muscles or limbs, for some time before loss of sensibility, or of motion, takes place. The paralytic symptoms may, however, be preceded by so little suffering as not to interest the patient, or come under the cognizance of the physician. There is seldom much tenderness upon pressing the spine, or increase of pain upon percussion of, or when pressing the spinous processes. After a time, and sometimes without much previous disorder, simple diminution of sensibility or of the power of motion is experienced. This increases slowly. The patient is subject to tremour. The gait becomes uncertain, staggering, or tottering. He lifts and directs the extremities with difficulty and uncertainty. Ultimately the limbs no longer can support the body. Involuntary startings of the muscles, subsultus, or rigid contractions of muscles or limbs, occur. The paralysis ascends to the trunk, affects the excreting functions, and implicates in some degree the circulating and vital functions, [as well as those of respiration, digestion, and calorification, &c.] The pulse becomes slow, irregular, or weak; the limbs flabby, œdematous, and cold; sloughs forms on parts which sustain pressure. The urine is morbid, retained, or passed involuntarily, abounding in the sulphates and phosphates; and ultimately dyspnœa, coma, and death by exhaustion or by asphyxia takes place.

[Both acute and chronic *myelitis*, so far as we have observed, is generally preceded or accompanied by pains in the head, especially the occiput, and this symptom accompanies the disease in all its stages. The pain shoots down to the neck, back, and loins, sometimes passing over the cervical to fasten on the dorsal. Pain and rigidity of the muscles of the neck usually accompany the pain in the head, and the symptoms are greatly aggravated by motion. Though the dorsal vertebræ are most frequently the seat of the pain, it is not confined to the part, but extends over the body, disabling the patient from lifting or moving the arms or lower extremities without great suffering, while pressure over the part affected causes severe pain in a majority of cases. Other symptoms not mentioned by our author are great disturbance of the digestive functions, as impaired appetite, vomiting, constipation, disturbed sleep, a fretful, peevish, or desponding state of mind, a state of extreme lassitude and listlessness, great fatigue from slight exertion, and exasperation of the symptoms from slight shocks or jars.]

160. *C. Appearances in fatal cases of Myelitis.*—These consist chiefly of red softening of the cord in various degrees. It may extend through all the columns of a small portion of the cord, or along a large portion, and it may vary from a slight diminution of consistence to complete diffluence of the structure. It may affect only one or more columns, or it may be limited to either the white or to the gray structure, or it may extend to both. The softening is often yellowish, or presents merely a slightly red or pinkish shade. The changes in the cord may exist alone, or be associated with inflammatory changes in the pia mater and visceral arachnoid; much more rarely with changes between the dura mater and visceral arachnoid.

161. Rokitansky remarks that, in the cord, as in the brain, inflammation attacks sometimes the white structure, sometimes the gray substance, occasionally both together. But myelitis of the gray substance exists in long streaks, or in the whole extent of this substance, restricting itself to this structure, and producing a peculiar condition of the cord, as well as the increase of volume, which attends softening, and a peculiar form of dropsy, in which it occasionally terminates. Red softening of the gray substance is tinted, according to circumstances, of a chocolate brown, or plum colour, or rusty brown, or yeast-

yellow, and corresponds with the central softening of the spinal cord, described by Albers. In *chronic cases* of myelitis, yellow softening of the columns, and condensations or indurations in various grades and extent, have been observed. Indurations, conjoined with atrophy, chiefly of the white columns, have also been remarked.

162. M. Calmeil, who has paid much attention to diseases of the spinal cord, states, in relation to the comparative frequency of softening in the different regions, that, in twenty-five cases, six existed in the cervical region, eleven in the dorsal [illegible]ive in the dorso-lumbar, and two in the [illegible]. In one case only was the organ softened throughout. In one instance the left half of the cord only was softened; in two the anterior columns were alone thus altered. The softened nervous structure preserved its natural colour in ten cases. It presented a yellow tint in six; a rose tint in four; a red colour in three; and a brown hue in one. The softened molecules were mingled with blood-globules in one. The pia mater was brown in one case, was injected and red in seven, and covered by false membranes in two instances. It may here be remarked, that the white and yellow softening does not necessarily proceed from inflammation; but as it gives rise to nearly the same symptoms as the inflammation, the difficulty of separating them is great.

163. iv. Diagnosis.—*A.* It is of much importance to distinguish between *rheumatism* and inflammation of the spinal cord or of the membranes. The pain, both in the spine and in the corresponding nerves, or in muscles supplied by these nerves, will not be mistaken for primary rheumatism if this very correspondence be attended to, and if the girding or sense of constriction in the corresponding situations of the trunk be considered. The history of the case will also assist the diagnosis. It should, however, be recollected, that rheumatism may either extend or occur as a metastasis to the membranes of the cord. This has been supposed to be a very rare occurrence; but, according to my experience, although not frequently observed, it is by no means rare. When, however, it takes place, it is essentially inflammatory, assuming the sub-acute or chronic states of spinal meningitis, and hence no distinction is to be made between them in nature or treatment. It is only when rheumatism, in its usual forms, attacks parts in the vicinity of, or in nervous connexion with the spine, that the diagnosis is of importance. The spasms, the deep-seated burning sensation in the course of the spine; the tonic contractions of the muscles of the back, curving the trunk backward; the altered sensibility of the surface, with numbness or prickings in the extremities; the stupor or loss of motion will distinguish spinal meningitis and myelitis from rheumatism, which is unattended by cramps or tonic spasms, or by the constrictions or girdings of the trunk already mentioned. In the former, also, pressure or percussion, or pressure conjoined with heat, over the spinous processes, sometimes increases pain; but in the latter, pain is increased by pressure on the sides, or in the vicinity of these processes, and by motion of the affected parts.

164. *B.* The diagnosis between *spinal meningitis* and *myelitis* is much more difficult, inasmuch as the former generally influences more or less the functions of the cord, and inflammation of the visceral membranes of the cord is often associated with myelitis. Spinal meningitis, however, has a marked disposition to extend itself, and is frequently complicated with cerebral meningitis, especially in children, while myelitis is generally limited to a portion of the cord only. Acute spinal meningitis may, with much certainty, be inferred from three symptoms: the first is a general contraction of the muscles of the back, varying from simple muscular rigidity to violent spasm, or tetanic rigidity, occasioning complete opisthotonos. In meningitis of the base of the brain, the head is thrown backward, or the cervical portion of the spine is sometimes retracted, but the trunk preserves its form. The second symptom is the violent pain extending more or less along the whole spine. The third is the continuance of sensibility even of the limbs, although motion may be abolished by the pressure of effused lymph on the cord and roots of the nerves.

165. The febrile symptoms are more marked or more severe in spinal meningitis than in myelitis; and paralysis of motion either does not occur, or not until effusion disorders the functions of the cord, or until inflammation extends to the substance of it. In myelitis the pain is not so severe; and the most remarkable symptoms are, impairment or loss of motion, and diminution of sensibility. In chronic myelitis the membranes often become similarly, or even acutely affected, the symptoms most characteristic of both spinal meningitis and myelitis being present.—*Spinal Apoplexy* (§ 192, *et seq.*) is to be distinguished from both these diseases by the sudden accession of the severe symptoms, and by the rapid occurrence of the paralysis of motion, and generally, also, of sensation.

166. v. Complications. — Spinal meningitis may be associated with myelitis, and in such cases the symptoms of the one will be accompanied with those of the other. This complication is often a consequence of severe injuries; retention of urine, priapism, paraplegia, &c., frequently being present, according to the seat and severity of the injury. (See *art.* Paralysis, § 50, *et seq.*) One or both these diseases may be farther complicated with inflammation or caries of the vertebræ, or of the intervertebral substance; or with aneurism of the aorta, or with spinal apoplexy, or with some one or other of the organic changes implicating the spinal cord or its membranes, about to be noticed (§ 178, *et seq.*). Spinal apoplexy, when it fails of producing death in a very short period, is generally followed by spinal meningitis or myelitis, according to the seat of the sanguineous extravasation. The complication of spinal meningitis with cerebral meningitis has been sufficiently noticed above (§ 138, *et seq.*).

167. vi. Prognosis.—*A. Acute spinal meningitis* is a dangerous disease, and the association of this with cerebral meningitis is still more dangerous, although not necessarily fatal when actively treated at an early stage. Chronic spinal meningitis, when it has advanced so far as to cause paralysis, is seldom altogether removed; but the symptoms, both paralytic and spasmodic, may be considerably ameliorated, whether it has occurred as the primary malady, or followed the acute. At all periods during the course of chronic spinal meningitis, an acute extension of the disease, generally upward to the base of the brain may occur, especially upon exposure to any of the causes of the malady, or even after any phys-

ical or mental perturbation, and carry off the patient. I have observed this to take place in chronic cases even of ten or twelve years' continuance. In some cases the disease may advance slowly for many years; in others it may be stationary for as long a period; and in a few an amendment more or less considerable takes place. It is chiefly before the supervention of paralysis that treatment is most efficacious; and even in this early period the best devised means often fail: much depends upon the constitution, habits of life, and previous ailments of the patient. While writing this, a gentleman whom I attended nine years ago for acute spinal meningitis, affecting chiefly the cervical and dorsal regions, called upon me. He had been seen also by Drs. Chambers and Bright, in consultation with myself. His habits had been irregular, and the acute attack passed into the chronic, with paralysis of motion, which was more remarkable in one side than the other. The painful symptoms have long since ceased, and the paralysis is considerably less.

168. A lady, aged about forty, and very corpulent, was seized with acute spinal meningitis and suppression of the catamenia. She had had several children. The disease had existed three or four years when I was requested to see her. Paralysis of motion was complete from the neck downward, but sensibility was not impaired. Her spirits were good, and she still retained considerable power over the alvine and urinary excretions. She possessed only a very slight power of motion in one arm. Treatment similar to that about to be advised for the chronic form of the disease (§ 173, *et seq.*) was prescribed. She recovered gradually; could use both hands, and walk abroad. She went on the Continent; after some time she proceeded to the north of Scotland to the family seat, and continued in comparatively good health for a long time. She had, while at her residence in the North, what was supposed to have been an attack of fever, of which she died. It is more probable, from the presence of cerebral symptoms in her case, that an acute extension of spinal meningitis had supervened, and implicated the membranes of the base of the brain, and thereby proved fatal, as I have uniformly observed when the malady was thus extended.

169. A respectable tradesman complained of chronic spinal meningitis, consequent upon a fall on the lower part of the back, attended by partial paralysis of motion in both lower extremities, and constriction around the abdomen. I saw him occasionally for some years, during which time he was able to walk about with the assistance of a stick, or of the arm of a servant. After a time I was requested to see him, and was informed that he had called to his aid an irregular practitioner, who had confidently promised to cure him, and that he soon afterward became much worse, complaining of spasms, and of severe pain along the whole course of the spine. He was delirious, and generally paralyzed when I now saw him, but was soon afterward comatose. A gentleman, aged about forty, gradually became affected, as described under the head of chronic spinal meningitis (§ 159). Sensibility was not diminished, but voluntary motion was remarkably impaired in all his limbs. The bowels were always costive, and the power of retaining the urine was very much lessened, and ultimately lost. Still a full dose of opium or morphia enabled him to retain it from six to ten hours. He lived in this state for about twelve years. He afterward became much worse, was feverish, delirious, and comatose in succession. I examined the body of both these persons after death, and found the changes as already described (§ 160). The spinal cord appeared somewhat atrophied. Recent inflammatory appearances were observed in the membranes of the base of the brain and medulla oblongata in both.

170. *B. The prognosis of myelitis*, when *acute*, is generally most unfavourable, death often taking place in a few days, even although the treatment may have been both prompt and judicious. The *chronic* form is less unfavourable. It may continue for months, or even years, when limited in extent; or the patient may even recover partially. In these cases it may be inferred that the resulting lesions have either been slight, or at least partially removed, so as to admit of the continuance of life for an indefinite period. An exasperation of the disease is, however, apt to take place when exposed to causes of physical or mental perturbation. Although but little hope can be entertained of effecting a cure when confirmed paralysis exists, yet we may be more sanguine as to the result at an early stage. When, however, the powers of life are evidently sinking; or when the urine is very morbid in its constitution, or as regards the functions of excretions; or when the influence over the sphincters is lost, or especially when sloughs form on parts which sustain the pressure of the body, then hopes of sustaining life much longer cannot reasonably be encouraged. The danger is always greater when the cervical or dorsal portions of the cord are affected than when the lumbar region is attacked.

171. vii. Treatment.—The treatment of inflammation of the membranes of the spinal cord, and of the cord itself, varies much with the acuteness, the duration, and the special characters of individual cases, and with the constitution, state, and circumstances of the patient.—*A. Acute spinal meningitis* requires very prompt and energetic means, for, if the disease proceeds so far as to occasion its usual changes, the best devised means will often prove inefficacious. Blood-letting, general or local, or both, according to the habit of the body, strength, and age of the patient, is necessary, especially very early in the attack. The amount, as well as the repetition of the blood-letting, should depend upon the circumstances just mentioned; but I have generally preferred the application of cupping-glasses along the spine, followed by terebinthinate epithems or embrocations. The bowels should be freely evacuated; and this intention may be accomplished by the immediate administration of a full dose of calomel, or of calomel and James's powder; and within a few hours afterward by the infusion of senna or other aperients, which ought to be repeated until the desired effect is produced. Terebinthinate enemata are always beneficial, not merely in procuring a full evacuation of the bowels, but also in preventing the changes usually following acute inflammation of serous membranes, and hence the spiritus terebinthinæ may be given with benefit by the mouth; for when thus exhibited, and in such a mode as will not excite vomiting, it is more certain and prompt in preventing the effusion of lymph from these membranes than the free administration of mercury.

172. Besides the above, various other means have been advised by writers, especially very

deep incisions on each side of the spinous processes, by Goss; the cold affusion, or the application of ice along the spine, by Ollivier; and the warm or vapour bath by others. Cupping and scarification, or dry-cupping, when the former is no longer required, should be preferred to the first of these; the benefits or the effects produced by the second have not been shown, and the advantages produced by the third are very equivocal. Warm pediluvia and manuluvia, salt and mustard having been added to the water, are generally of service. But after the satisfactory operation of the means advised above, the due consideration of what should be avoided may be of more service than the employment of means of doubtful efficacy. The patient should lie on a hair couch, on either side, so as to keep the spine moderately cool, and allow the application and renewal of such agents to it as have been advised. Vomiting, straining at stool, and motion should be prevented as much as possible; and if the urine be not duly evacuated, it should be drawn off frequently, care being taken not to allow an accumulation of it in the bladder for any considerable time. Cooling diaphoretics or refrigerants are always of service as long as febrile symptoms continue. Blisters are rarely of service, but are oftener productive of irritation of the urinary passages. Terebinthinate epithems or embrocations such as I have advised in various parts of this work, or a combination of these with opium —the tincture, wine, &c.—are very frequently of use, and may be repeated daily, or twice in the day. If the pain and sympathetic affections of spinal meningitis continue, notwithstanding the means above prescribed, the tincture or extract of *aconite* will often prove of much service, when exhibited in sufficient doses.

173. *B.* If *chronic spinal meningitis* either follow the acute or occur primarily, certain of the means already mentioned may be cautiously employed. In some instances, scarification and cupping, or dry-cupping, or a repetition of these, may be still resorted to, especially at an early stage of the primary chronic, or during the insidious commencement of the disease. The intestinal and urinary evacuations always require attention. Various counter-irritants have been advised, especially blisters, issues, moxas, setons, tartar-emetic ointment, the actual cautery, &c. I have very rarely seen either blisters, or setons, or issues, or the tartar-emetic ointment, of any service in this state of the disease. Of moxas and the actual cautery, I have not had sufficient experience. Dr. Bennett states, that he has seen the latter agent produce a cure in two cases of chronic spinal meningitis, occasioned by diseased vertebræ. It is most probably in this complication that the actual cautery, setons, issues, and moxas are most likely to be of benefit. In other circumstances of the disease, the terebinthinate embrocations or epithems along the spine, or the frequent sponging of the surface of the spine with a strong solution of bay salt, have been more serviceable, according to my experience, than either of these.

174. In chronic spinal meningitis, I have not found lowering measures of much service, especially when far advanced or of long standing; and when it has produced paralysis, owing to the changes consequent upon inflammatory action, I have generally prescribed such means as seemed most likely to support vital resistance to the extension of the disease, and at the same time to remove the structural alterations which may have already been produced. With these views I have given small doses of the bichloride of mercury, with hydrochlorate of ammonia, and either the decoction or the tincture of cinchona, and the fluid extract of sarza; and after this combination has been continued for a considerable time, but with strict reference to its effects, I have substituted the iodide of potassium and the carbonate of potash, or liquor potassæ, or Brandish's alkaline solution, for the bichloride and the ammonia, the other medicines being continued in conjunction with the iodide and fixed alkali.

175. *C.* The *complications* of either the acute or the chronic state of spinal meningitis clearly demand means such as have been advised. When acute cerebral meningitis is associated with the spinal disease, the best devised means are generally inefficacious, but those already prescribed appear the most appropriate. The complication of chronic spinal meningitis with rheumatism requires the same indications of cure, and similar means to those noticed above (§ 171, *et seq.*). But in this state of the disease, as well as in certain other chronic complications or forms, medicated warm baths, especially such as contain stimulating substances, deserve a cautious trial; and if they be found of the least service, they should be sufficiently tried. In one case in which the spinal malady appeared in the course of very prolonged jaundice (§ 152), the more severe symptoms were somewhat mitigated, notwithstanding the persistence of the primary disease. The association of spinal meningitis with disease of the vertebræ, or of the cord itself, has been treated by me according to the principles now enunciated; and I have no experience of any other means than those already noticed which appear to be of any service in those or other complications of the malady.

176. *D. Acute Myelitis* requires similar means to those already advised for acute spinal meningitis; but, even at an early stage, vascular depletion is not so beneficial, and admits not of being so freely employed in the former as in the latter. The other means, especially the internal medicines and the external applications, particularized above, may be resorted to. In addition to these, urtication, warm baths containing stimulating and rubefacient substances, anodyne and terebinthinate enbrocations along the spine, and the preparations of aconite when spasm or pain is urgent, may severally be employed. The paralytic symptoms, which are generally much earlier and more complete in myelitis than in spinal meningitis, may be combated by the bichloride of mercury, or by the iodide of potassium, and the other remedies, as combined above (§ 174). The preparations of *nux-vomica* or *strychnine* have been recommended, and too frequently and injuriously employed in these cases. In all cases which may be inferred, from the mode of attack, or from the characteristic symptoms, to be either acute or chronic myelitis, we have few, and oftener no, means of ascertaining the nature of the changes which have taken place in the cord and its membranes; and hence those preparations, especially strychnine, which excite or irritate the spinal cord, should, if prescribed at all, be exhibited with great caution.

[We trust mainly, in these cases, whether of an acute or chronic nature, to free local deple-

tion with cups or leeches, and the constitutional action of mercury. We have known slight ptyalism, maintained for a considerable time, attended with the happiest results. In one instance, the paralysis, which had been of several months' duration, began to yield as soon as the mouth was affected; and free salivation unexpectedly occurring and persisting for a considerable time, notwithstanding the means employed to arrest it, the patient continued rapidly improving, and eventually a perfect cure was effected.]

177. *E.* In the more or less *chronic* states of myelitis, various means have been tried, but rarely with more than very temporary relief. In these states especially, the preparations of nux vomica, of strychnine, of arnica, phosphorus, &c.; electricity, galvanism, electro-magnetism; frictions, with various stimulants and irritants, and external derivatives, may severally be resorted to, according to the peculiarities of the case, but they require both discrimination and caution. It is only in the more protracted cases of either myelitis or spinal meningitis, where the symptoms indicate passive, rather than active disease—when neither acute nor painful symptoms are present—that these means should be employed. Farther remarks on the use of these and similar means will be found in the article Paralysis (see § 244, *et seq.*), and in my work on *Palsy and Apoplexy*, see p. 397, *et seq.*

[Patients are generally recommended to keep the recumbent position when labouring under myelitis or spinal iritation of a severe grade. But the sufferer from these diseases cannot lie long on his side, because the nerves of the arms, sides, hips, and lower extremities, the seat of the neuralgic pains, cannot bear pressure, but are made immediately more painful by it. Hence the patient involuntarily turns on his back, by which pressure is made on the seat of the disease, and though much pain may not at the time be increased by this position, yet the neuralgic affections will be aggravated by its being long maintained. The back may be the easiest part, but there will be acute pain, soreness, numbness, and neuralgic suffering throughout the course of the nerves, proceeding from those portions of the spinal cord which have been subjected to pressure. Some relief may be obtained from the careful adjustment of feather-beds and pillows, &c., but in all cases where it can be obtained we would strongly recommend *Dr. Arnott's hydrostatic bed.* Its use not only contributes vastly to the comfort of the patient, but exerts a decidedly remedial and curative influence.]

VIII. Structural changes of the Spinal Cord and of its Membranes.

Classif.—IV. Class, III. Order (*Author*).

178. i. Morbid states of the Spinal Membranes.—The *dura mater* of the spinal cord is unprovided with the granulations called Pacchionic glands. It is not so firmly attached to the bones as that of the brain, and the arachnoid and pia mater are more loosely united to the cord than these are to the brain. Owing partly to these circumstances, diseases of the spinal bones less frequently affect their contained structures than those of the cranium.

179. *A.* The membranes of the cord are sometimes *distended* by fluid, *discoloured*, and present various grades of *consistence*, but not so frequently as those of the brain. *Irritation*, vascular *erethism*, and *congestion* often are observed, especially in continued fevers, in the exanthemata, in tetanus, in rabies, in spinal epilepsy, convulsions, gout, rheumatism, &c.; but these are not to be confounded with true *inflammation*, which, however, may occur as an epi-phenomenon in these diseases. All the alterations consequent upon inflammation of the membranes of the brain are observed after spinal meningitis, as effusions of *plastic lymph*, or of *serous*, *sero-albuminous*, or *puriform fluids*, *thickening*, *induration*, *agglutination*, and partially organized *adhesions* of the membranes, *cartilaginous* and *ossific deposits*, and much more rarely *ulceration* and *mortification*. *Tubercular* formations, *tumours* of various kinds, *cancer*, and *hydatids* have also been found in these membranes on rare occasions.

180. *B. Morbid or effused fluids* are usually contained in the more external sac formed by the arachnoid membrane; but sometimes, as in the brain, between the arachnoid and pia mater; occasionally also between the dura mater and the bony parietes of the canal. Admitting that a limpid serum naturally exists between the spinal membranes, yet an inordinate as well as a morbid effusion is not infrequent, particularly in tetanus, epilepsy, some fevers and eruptive diseases, paraplegia, epilepsy, chorea, &c. The more morbid effusions between the membranes are that of *air* (Ollivier, Briere, Otto, &c.); large *collections of water*, dropsy of the spine, *hydrorhachis* either in an acute or chronic form; it may take place alone or in conjunction with dropsy within the head; when great, it usually produces universal palsy, owing to its pressure on the cord; *puriform matter*, proceeding from ulceration of the spinal marrow or of its membranes, as in bed-ridden persons; or from the cavity of the skull (Denmark, Otto); or from carious vertebræ, as well also as effused from abscesses in the vicinity (Brodie, Velpeau, Jackson, &c.); *albuminous lymph*, or a *coagulable* and *organizable matter*, exuded by inflammation of the membranes, or by metastasis of rheumatism to them, as observed also in paraplegia, general paralysis, and in some cases of chorea (Copland and Pritchard); and, *lastly*, a *bloody fluid* or *pure blood*, liquid or coagulated, arising from injuries of the spine, from concussions of the trunk, from the breaking of an aneurism of an adjoining vessel, as of the aorta, or spontaneously from disease of the spinal vessels, or from some internal cause (Howship, Ollivier, Chevalier, &c.).

181. ii. Morbid states of the Spinal Marrow.—*a.* The *size* and *form* of the spinal cord vary materially. They generally correspond with the length and form of the spinal column: the cord may be too long or too short, in proportion to the rest of the body. Sometimes it is congenitally *thinner* or smaller, either in parts or throughout, especially in monsters with deficient or distorted heads and limbs. But it is subject to a morbid diminution of size—a true *atrophy*, as in *tabes dorsalis*—dorsal consumption. In this latter case, it is sometimes wasted more in one place than in another, being apparently indented and knotty. Atrophy is most frequently met with in extreme old age—*atrophia medullæ senilis*; in protracted cases of paraplegia and general palsy; and in the lumbar region of the cord, as a consequence of loss of the generative power, and of spermatorrhœa. It often extends upward along the cord. It may also arise from the effusion of lymph between the membranes—of this associa-

tion I have met with several instances—in chronic spinal meningitis consequent upon rheumatism, and in connexion with chorea. In some cases, the diminution of volume is associated with a dirty whiteness and toughness of the fibrous columns, and with a rusty-brown or fawn tint of the gray substance. In other instances, the cord is not only thus discoloured, but also infiltrated with serum, soft and withered (Rokitansky).

182. The cord may be more or less *thin* in parts, from *compression* by the adjoining bones, or by invasion of the canal, by thickening of the intervertebral substances, by bony concretions, by varicose states of the spinal vessels, by aneurisms of the vertebral arteries, by effused blood or other fluids, by hydatids, or by tubercles, or by cancerous or other tumours. The pressure of either of these may be such as almost to divide the cord, or to reduce the pressed part to extreme thinness.

183. The cord may be unnaturally *long* in new-born infants. Béclard found it to descend to the tail-bones in two children born with tails. Extreme *thickness* at certain parts is only congenital; but a portion of the cord may be morbidly swollen, owing to either extreme congestion, or effusion of blood (apoplexy of the cord), or of pus, or of other fluids, in its substance. The *form* of the spinal marrow is most commonly affected by *dropsy* or *hydrorhachis*, also called cleft spine, or *spina bifida*, when connected with an open state of the vertebral canal. This is naturally a congenital malady, associated with cleft of the spinal canal, and often also with internal dropsy of the head, hemicephaly, and hydrencephalocele. It generally terminates fatally with paralysis. But cases have occurred of children living many years with the disease, and even reaching puberty. Paletta and Acrel met with it at seventeen years of age; Henderson at eighteen; Apinus, Warner, and Hochstetter at twenty; and Camper at twenty-eight. I saw a case of it, with immense tumour in the loins, in a female of about twenty. In rare instances, dropsy of the spinal cord has occurred after birth, and even in adults. This change, in connexion with the state of the spinal marrow, is more fully described in the article Dropsy. (See *Dropsy of the Spinal Cord*, § 178.)

184. *b. A rupture*, or rather *protrusion* of the spinal marrow, may occur from *hydrorhachis*, so that, being itself expanded by the water, or compressed between the membranes by this fluid, it may be more or less protruded through the cleft in the spine, thus forming a *rupture of the spinal marrow* (*hernia medullæ spinalis*). In very rare cases, the cord may deviate from its natural position, in consequence of caries of its bony walls (Ferro, Lecat, Phillip, and Richter). The *colour* of the spinal cord may vary, as that of the brain, but very seldom without change of structure, excepting in some rare instances of jaundice.

185. *c.* The *consistence* of the marrow is more liable to vary. It may be *simply softened*, without farther change, or it may be softened with change, of its intimate structure, forming the *pulpy degeneration* described above (§ 160), and when treating of the Brain (§ 71, *et seq.*). Its structure may be even entirely broken down: it may be almost liquid or diffluent, or this state may present a mixture of blood. The broken-down state, either with or without blood being effused or infiltrated in the part, may exist only in spots, or in a considerable portion of the cord, and is to be ascribed to diseases which destroy its cohesion, especially inflammation, suppuration, watery infiltration of the substance of the part, and to a morbid or deficient state of its nutrition. Paraplegia, more or less complete, or paralysis, more or less general, is the usual result of softening, and pulpy degeneration of the cord.

186. *d.* On the other hand, the structure of the cord may be *too firm*, or even *hard*. This state is sometimes conjoined with diminution of size or atrophy in dorsal consumption, and with thickening after chronic inflammation. Portal, Bergameschi, Esquirol, Birch, Velpeau, and Ollivier have found different portions of the spinal marrow nearly as hard as cartilage, particularly in epileptic, insane, and paraplegic persons. Gendrin has observed the same cord very hard in one part, and very soft in others.

187. *e.* The *continuity* of the structure of the cord may be destroyed by disease, as by extreme pulpy degeneration, by the *laceration* occasioned by the effusion of pus or of blood, and by concussion of the spine. This lesion is, however, more commonly occasioned by wounds, violent extension, fractures, and dislocations of the vertebræ. In some of these cases the marrow protrudes through the opening in the pia mater. Small wounds of the cord may in some cases heal.

188. *f. Inflammation of the Substance of the Cord.—Myelitis* (§ 154) is in some instances an idiopathic disease, and in others it results from external injuries and diseases of the surrounding structures. Inflammation is to be distinguished from congestion of this part, both in respect of their characteristic appearances and of their usual consequences. Inflammation may appear in the slightest form of *vascular irritation*, unaccompanied by any very marked change of structure, as in many fevers, eruptive diseases, rabies, epilepsy, convulsions, trismus, tetanus, painters' colic, chorea, in all of which the spinal marrow may be more or less affected. This organ may be more unequivocally inflamed either primarily or idiopathically, or consecutively and contingently, especially in the course of some cases of the above diseases. When truly *inflamed—myelitis*—the substance of the cord exhibits a rose-red colour, with some deeper-coloured or dusky spots and streaks, with enlargement of its minute vessels, and injection of the pia mater surrounding the part. In some cases, there is a distinct swelling, and generally some change from the natural consistence, namely, softening, or complete disorganization, or dissolution into a semi-fluid, discoloured by, or mixed with blood. In rarer cases, the inflammatory appearances are accompanied with hardening. Myelitis seldom terminates in *true suppuration*. In rare instances, small abscesses have been found in the cord. *Gangrene* is still more rare. *Ossific deposits*, or *bony concretions*, which are sometimes found in the membranes (§ 179), do not seem to form in, or even to invade the structure of the cord.

189. *g. Congestion* of blood in the spinal cord may be consequent upon, or conjoined with a varicose state of the veins, or with congestion of the venous sinuses of the vertebral column; and the congestion when extreme, and especially when connected with atheromatous or fatty degeneration of the vessels (see *art.* Arteries, § 59, *and*

my work on Palsy and Apoplexy, p. 266, 288), may terminate in *effusion of blood* in the substance of the cord, or between the membranes, or external to the dura mater, and between it and the walls of the canal (Abercrombie), owing either to rupture of the diseased vessels, or to sanguineous exudations from them, produced by certain obvious causes, or occurring spontaneously, and without any assignable cause—*apoplexy of the spinal cord.*

190. *h. Hæmorrhage into or from the spinal cord*, according to the seat of the vessels whence it proceeds, may exist between the pia mater and the arachnoid—in the internal sac of the arachnoid; and, when thus seated, there being no laceration of the structure of the cord, it may be inferred that the blood has proceeded from the vessels of the pia mater. In most cases of hæmorrhage into the substance of the cord, the effusion has taken place in the gray substance, and has even been infiltrated to a great extent along the internal canal of its axis (Cruveilhier, *Anat. Pathol.*, livr. 3d). Circumscribed extravasations are also found in the structure of the cord, the blood effused undergoing the same changes as described in cerebral apoplexy, and the surrounding nervous tissue also presenting similar alterations (Hutin, Stroud, Gaultier, Grisolle, Bennett, &c.).

191. iii. Apoplexy of the Spinal Cord.—*Hæmorrhage may take place into the external sac of the arachnoid — between the dura mater and arachnoid; or into the internal sac of the arachnoid, or between the pia mater and arachnoid.* When thus seated, the hæmorrhagic effusion has been called *Hæmatorachis* by Ollivier. *When the hæmorrhage occurs into the structure of the cord*, it has been termed *Hæmatomyélie* by this writer.

192. *A.* The *causes of spinal apoplexy* are chiefly injuries sustained on the spine, especially blows, falls, fractures, concussions, &c. Spontaneous hæmorrhage in either of the situations just specified, or *between the dura mater and the walls of the vertebral canal*, is rarely met with; and when observed, is to be attributed chiefly to pre-existing disease of the vessels (§ 186); extreme exertion or efforts of any kind, or unusual demands made upon the circulation of the cord, or whatever interrupts the return of blood from or through the vertebral sinuses, being the more immediate or exciting causes.

193. *B.* The *symptoms* of spinal apoplexy have been imperfectly observed, owing to the rarity of the disease and to the early progress of it having passed unobserved by competent persons. The mode of attack necessarily varies with the seat and amount of effusion. The most frequent phenomena characterizing the attack are pain, sudden and acute, in the region of the spine corresponding with the seat of extravasation, convulsion, and paralysis. Precursory shivering and pain are sometimes experienced shortly before the complete or severe seizure. M. Calmeil adduces several cases to prove that, when the hæmorrhage takes place between the membranes, the pain is always acute, and is attended by convulsion or spasmodic contractions, paralysis being slight, or absent, unless the hæmorrhage is very considerable; and that, when paralysis of motion, or of motion and sensation, is sudden and more or less complete, convulsions being slight or absent, the spinal cord is then itself the seat of extravasation. When the hæmorrhage occurs in the cervical region, or in the upper part of the dorsal region, then priapism is generally present, as commonly also observed when these parts of the cord are injured by dislocations or fractures. Constipation and retention of urine are observed at first, and these may be followed, if the disease be not quickly fatal, by loss of power over the sphincters; these symptoms, however, depending much upon the seat and amount of hæmorrhage. When the effusion occurs in the higher regions of the cord, paralysis of the muscles of respiration soon supervenes, owing either to the amount of effusion, and in this case death quickly supervenes, or to the changes consequent upon the effusion, and then this issue is longer in occurring. The changes may extend upward, even when the hæmorrhage is low in the spine, and cause death by paralysis of the respiratory muscles, and asphyxia. The following case, recorded by Mr. Curling, will illustrate the symptoms and appearances after death of this malady:

194. A gentleman, aged forty-four, a stout man, of active habits, but a free liver, and subject to gout, had just got into bed about eleven P.M., when he was suddenly seized with spasms in the stomach, and found that he had lost all sensation and power of motion in the lower half of the body. An hour after this seizure the patient was found shivering in bed by Mr. Curling, with complete paraplegia of the whole of the body below the third ribs, and strong priapism. He had perfect use of the arms, but complained of pain about the wrists. No excito-motary actions were producible. His mind was quite clear. After the circulation was restored, the treatment consisted chiefly of cupping between the shoulders, a blister at the nape of the neck, purgatives to unload the bowels, frequent doses of calomel, and regular relief of the bladder. The priapism subsided in about twenty-four hours. There was no extension of the paralysis, except numbness in the hands, and at last imperfect power of using them. During the first eighteen hours after the attack, scarcely any urine was secreted, and it subsequently continued scanty in amount. The breathing gradually became embarrassed and difficult, and the patient died the fourth day after the seizure, his intellect being unaffected until within a few hours of his death.

195. On examination after death, the muscles of the back were much loaded with blood. No fluid escaped on opening the theca vertebralis, the head being in a depending position. The vessels on the surface of the cord were very congested. An incision was made along the front of the medulla, commencing at the part corresponding to the third cervical vertebra, and terminating at the last dorsal. There were two small clots of blood, amounting together to about a drachm, in the interior of the medulla, occupying about an inch and a half in extent, and situated between the origins of the second and third pairs of dorsal nerves. The substance of the cord around the clots was somewhat soft. The medulla was more or less infiltrated and stained with blood from the site of the clots, upward as high as the third cervical vertebra, and downward as low as the last dorsal.—(*Third Report of the Proceedings of the Pathological Society of London*, p. 28.)

196. *C.* The *diagnosis* of the lesion, when marked, is not very difficult. The suddenness and severity of the pain, of the spasms, or of the

paralysis, and the degree of constitutional or vital shock which ushers it, distinguish it from other spinal affections, and prevent it from being mistaken for rheumatism, with which slighter and more gradual attacks may be confounded. The priapism, where the upper portion of the cord is the seat, and the states of the excretory functions, farther aid the diagnosis.

197. *D.* The *prognosis* is always most unfavourable when the attack is such as to admit of a confident diagnosis. But the issue may be protracted, especially when the lower portion of the cord is the seat of hæmorrhage, and is then to be ascribed chiefly to consecutive changes, which may require an indefinite period to produce their ultimate effects. When the effusion is near the pons or medulla oblongata, or even when it is in the cervical region, and especially if it is of considerable amount at any part of the upper regions of the cord, then death may occur immediately, or in a few hours, or in less decided cases in a few days. M. Hutin found in the cervical portion of the cord two clots of blood. The person died during the night. When the hæmorrhage is very limited, restoration of the lesion, and even of the functions depending upon the seat of lesion, may take place. M. Cruveilhier states, that a medical student lived five years after a circumscribed hæmorrhage in the left side of the cervical portion of the cord. Loss of motion was experienced in the same side—in both the lower and upper left extremity. The patient died of a much greater hæmorrhage than the first, and the seat of that was found cicatrized, the blood having been absorbed, and the movements of the side gradually restored. This case shows that hæmorrhage into the substance of the cord and the seat of hæmorrhage undergo similar changes to those observed in the nervous structures contained within the cranium—that apoplexy of the cord may be recovered from; remains of old apoplectic cysts, similar to those observed in the brain having been met with in the substance of the cord, particularly in its cineritious structure.

198. *E.* The *treatment* of spinal apoplexy must be founded more upon the analogy of this disease with cerebral apoplexy than upon the results of experience. It may be directed with the following intentions: 1st, to arrest, or to prevent a recurrence of the effusion; 2d, to favour the absorption of the extravasated blood; and, 3d, to keep within due bounds the vascular reaction or irritation accompanying or following upon the process of reparation in the seat of injury. For these purposes, blood-letting, chiefly by cupping-glasses applied on the spine, according to the pulse and habit of body of the patient; terebinthinate epithems or embrocations along the spine; the facial or lateral recumbent posture, perfect rest; attention to the secretions and excretions; frequent recourse to the catheter, if it should be at all required, and the earliest and utmost endeavours to prevent bed-sores by recourse to air-pillows, the hydrostatic bed, &c., comprise the chief means that will be found useful in these seizures. Most other measures will either prove inefficacious or injurious, excepting such other means as have been advised for *myelitis* (§ 171, *et seq.*), which may supervene upon the more limited or slight attacks of hæmorrhage.

199. iv. Tumours of various kinds, developed in, or near to the Spinal Cord, produce effects which terminate fatally, after having occasioned, for an indefinite period, paraplegia or general paralysis. The tumours, or morbid productions or growths, which may implicate the cord or its membranes, are of various kinds; they may be formed either in the vicinity of the theca, or in the membranes, or even in the cord itself. Certain of these are developed exteriorly to the cord only, and others may even be primarily formed in it, although very rarely, as well as in its membranes or in its vicinity. *Aneurisms* of the aorta may produce ulceration and absorption of the bodies of the vertebræ, and ultimately affect the membranes, or even the spinal marrow itself. *Hydatids* may produce similar effects.

200. *a. Cartilaginous productions* may invade the vertebral canal, or *exostoses* may form within the canal, diminish its calibre, and press upon the cord. In a case recorded by Mr. A. Key, the ligaments covering the intervertebral substance between the second and third lumbar vertebræ were hardened and prominent, projecting so far into the canal as to diminish it by one third of its diameter. The patient had lost the power of motion, but retained sensation of the lower extremities. In another case of loss of power of motion, numbness and tingling from the loins downward, retention of urine, and imperfect command over the sphincter ani, were experienced, terminating in sloughing of the nates and death. "The intervertebral substance above the 12th dorsal vertebra, with the ligament covering it, presented a slight ridge, projecting into the medullary canal, as if an ossification from the edge of one bone tended to unite with a similar growth from the other edge. This transverse ridge manifestly narrowed the canal."

201. *b. Tumours*, fibrous, fungoid, or otherwise organized, malignant or non-malignant, may grow exteriorly to the vertebral canal, and may invade not merely the walls of the canal, but also the membranes and cord itself; or such tumours may commence in, or be attached to, the dura mater of the cord. *Tubercles*, and melanoid and other *cancerous growths*, are very rarely found in the spinal cord, although not infrequently seen in the brain. *Tubercle* occurs only in connexion with tubercles in other organs, and chiefly in the cervical and lumbar regions of the cord, where it occupies the white fibrous structure, and sometimes the gray substance. As in the brain, so in the spinal cord, it occasions red or inflammatory softening, or yellow softening of the surrounding tissue. In some cases, several tubercles, not exceeding the size of millet or hemp seeds, are grouped together. In others, only one tubercle of the size of a pea or bean is found.

202. *c. Cancerous formations* are very rarely found in the cord, and even then chiefly in a secondary form, or in connexion with similar productions in other parts. The very extensive experience of Rokitansky furnished him with only one instance of true and primary cancer of the cord. But he has met with several instances of circumscribed callous induration of the white columns, of the cancerous nature of which he is in doubt. Ollivier mentions several examples of diffused carcinomatous growths implicating the spinal cord, as well as of so-called colloid cancer.

[*Cancer of the Spinal Cord.*—Cancerous degeneration of the spinal cord is an extremely rare disease. The French translator of Meckel's Anatomy (*Am. ed.*, p. 507, vol. ii.) remarks, that "we know as yet of no well-authenticated case of can-

cer of the spinal marrow." Andral, although he collected 43 cases of cancer of the brain, recorded none of the spinal cord itself, from which we infer that the disease had escaped his observation. Guersent mentions a case of cancer of the medulla oblongata, which had principally destroyed the pyramids and olivary bodies. Cruveilhier has described a case of cancerous tumour under the arachnoid membrane, opposite the third dorsal vertebra, resulting in fatal paraplegia.—(*Anat. Path.*, liv. 32, *Fig.* 2, 2, 2.) This tumour is described as of an ovoid shape, of a grayish colour, soft in consistence, and occupying the anterior face of the cord. This seems to have been a case of cancerous tumour originating in the membranes, and only affecting the cord by mechanical compression. Cruveilhier remarks, that it is not uncommon to find grayish red granulations, of the same consistence as those of the brain, in the cellular tissue beneath the arachnoid of the spinal cord, just as they are met with under the same membrane below the dura mater in the brain. This pathologist also refers (*loc. cit.*) to a case observed by M. Duplay, one of M. Rostan's assistants, in a man 63 years of age, who died paraplegic, cerebral hæmorrhage supervening, with loss of sensation and motion, and where two tumours were discovered beneath the arachnoid; the lower one among the nerves of the *cauda equina*, of the size of a large filbert, grayish, soft, granular, and semi-transparent; its surface being traversed by large veins, which formed a kind of sheath. The other tumour occupied the superior and posterior part of the dorsal region; was olive-like, and of a similar structure to the tumour below. The posterior and middle portions of the spinal cord were of a pulpy consistence, grayish, and semi-transparent in their whole corresponding portions. Cruveilhier refers to tumours of an encephaloid nature attached to the membranes, one of which he has observed growing from the dura mater of the cord, attached to it by a pedicle of a grayish hue, soft, and enveloped by a fine membrane. In the *Trans. of the Royal Med. and Chir. Soc. of London* (2d *Ser.*, vol. i., 1841), we find four well-marked cases of cancerous or malignant disease of the spine, described by Mr. Cæsar Hawkins, which constitute by far the most important additions to the pathology of this disease, as it attacks the bony column, hitherto recorded. Abercrombie (*Dis. of Brain*, 3d ed., p. 369, 1836) has quoted a case from Gendrin, in which "a firm white tumour, the size of a filbert, enclosed in a cyst, and slightly softened in the centre, was found at the lower extremity of the cord. It lay between the two columns of the cord of the left side, and in some degree encroached upon those of the right; the left anterior column, in particular, was much distended and flattened by it." Calmeil has also recorded a similar case.—(*Article Moëlle Epinière, Dict. de Med.*, 2ème edit., xx., p. 52, 1839.) Another case is given by M. Ollivier (*De la Moëlle Epinière*, &c., de 3ème ed., tome ii., p. 503, 1837).

Cancer of the Spinal Meninges.—There have been a few cases recorded showing that cancerous disease may attack the various membranes of the cord, and the interspaces between them. Walshe (*Nature and Treat. of Cancer*, Eng. ed., p. 526) has related a case where the cellular membrane between the vertebræ and dura mater was the sole seat of the disease; and Dr. Abercrombie found in one case a spongy tumour of a grayish yellow colour, resembling fungus hæmatodes, within the foramen magnum, attached to the inner surface of the dura mater of the cord; and in Cruveilhier's case (*loc. cit.*) the tumour was attached to the same membrane by a narrow fibrous peduncle. M. Hardy and M. Collin have published cases where encephaloid tumours have been found growing in the arachnoid cavity, attached by tender filaments to the medullary laminæ of the membrane. Cases of this disease, situated in the cellular membrane, between the pia mater and deep laminæ of the arachnoid, may be found described by Dr. R. Reid, Dr. Fisher, M. Velpeau, and M. Cruveilhier. (See *Bibliog. at end of Article.*)

The following case, which fell under my own observation and management, is not without some interesting features: The patient, A. C., was supposed to labour under some obscure form of disease involving the spinal cord. He was of a strongly-marked nervous temperament, thin, emaciated form, and about 45 years of age. I found him labouring under great functional derangement of all the important organs, especially the kidneys and liver; the urine was loaded with phosphatic deposits, and highly ammoniacal, while immense quantities of fine, bilious, calculous matter and cholesterine passed off with almost every evacuation from the bowels. He moved about with much difficulty, complained of constant pain in the back and loins, and at times severe neuralgic pains would attack the muscles of the trunk and extremities, or some of the large internal organs. The pain through the loins and kidneys was so severe, that it was thought, in connexion with spinal disease, there were renal calculi in the substance of the kidneys. The tenderness over the lower dorsal and upper lumbar vertebræ, on pressure, was considerable. The disease had been coming on insidiously for nine or ten years previously, the prominent symptoms being nervous debility and hypochondriasis, general and local neuralgic pains, deranged digestion, with loss of appetite, &c., and great irregularity of the bowels. The neuralgic pains were most severe in the lumbar region, extending to the lower limbs—first to one side, and then to the other—and gradually becoming general and most excruciating, so as to require 15 grs. of *morphia* in the course of from four to eight hours, in order to procure ease and sleep. The treatment need not be particularly detailed, as it proved merely palliative, including the constitutional action of mercury, local bleeding, blisters, setons, electricity, mineral and vegetable tonics, narcotics, &c. The latter remedies alone afforded any alleviation to his agony. For the last three years his bowels had only been moved by enemata, and even the most active cathartics would not operate without their aid. About six months before his death, he lost entirely the use of his legs, which retained in some degree the power of sensation, and he was wholly confined to his bed. Previous to that time, slight motion caused exquisite pain, so that his screams could be heard at a considerable distance, though usually a man of great fortitude. He sank, at last, from gradual exhaustion. Nothing important could be ascertained with regard to his former habits of life, except his being addicted to excessive venery and the most inordinate use of tobacco.

Autopsy, ten hours after death, disclosed a healthy state of the thoracic and large abdominal viscera; the kidneys were somewhat of smaller size than natural, but their texture, as well as that of the liver, was natural. The colon, in several places, was contracted for the space of several inches to the size of the little finger, its coats being evidently thickened and somewhat indurated. Hard scybalous masses were found in considerable quantity above these contractions in the gut. The principal disease was found in the lumbar portion of the spinal cord, opposite the last dorsal and two upper lumbar vertebræ. At this part, for a distance of several inches, the membranes of the cord were found involved in a *cancerous* degeneration, apparently originating in the spinal cord itself, disorganizing its texture, especially its anterior portion, but more or less its whole substance. The spinal marrow, for the space of two or three inches, was changed in colour and density, some portions being softened, and almost diffluent, and interspersed throughout were deposits of melanotic matter; while other parts were of abnormal hardness, and of a dirty white or yellowish hue, intersected with blood-vessels crossing in every direction. The pressure of the cancerous tumour on the spinal column had caused the absorption of a portion, probably two thirds, of the bodies of the two upper lumbar vertebræ; and these cavities, varying from one to two inches in depth, were filled with portions of the diseased mass. The diseased portion filled up the cancellated texture of the bones, and was separated with great difficulty, some of it being soft and semi-fluid.

It is doubtful whether there are any pathognomic symptoms of this affection. In nearly all of the recorded cases, pain, often the most excruciating, was present. Mr. Hawkins observes, that he never saw evidence in any other disease of the spine of such exquisite suffering as in two of his cases. When with this we associate derangement of all the peculiar functions of the spinal marrow, in some cases amounting to a total abolition of the power of sensation and motion, twitchings and spasm of the muscles, with more or less derangement, also, of the functions of the liver, kidneys, bladder, &c., with extensive neuralgic pains, we shall be aided in our diagnosis. At first the pains may resemble those of rheumatism, slight, perhaps, but gradually becoming more constant and acute, pain and tenderness on pressure, an inability to lie in certain positions and perform certain movements, according to the portion of the cord affected. There may also be some external swelling, or a prominence of one or more of the spinous processes; and if the nerves have become implicated in cancer of the cervical vertebræ, pain may be expected about the neck and over the scalp: in one case there was difficulty in swallowing. Pain, numbness, loss of sensation and motion, and involuntary spasms, involving the lower limbs, have been observed in nearly every case of the disease hitherto observed. Loss of power over the sphincters of the bladder and rectum is also to be expected in severe cases, together with an alteration in the intestinal secretions, permanent alkalescence of the urine, disposition to sloughing, œdema, &c. In this affection, death results from the cachectic state, the patient being gradually worn down by severity of suffering and failure of digestive power. The treatment can, of course, be only palliative. In cancer of the *spinal meninges*, the medulla may or may not be involved. *Myelitis*, with softening, may result from the mechanical pressure, and the symptoms will vary, according to the greater or less degree of complication of the cord itself. In a great majority of cases, alterations of sensibility and movement may be looked for in the parts below the seat of the disease. At first, muscular power is lessened; then the limbs are stiff and difficult to control; tonic contraction, or painful convulsive movements, may exist in some cases, constituting a form of painful paraplegia. Sensibility or motion will be affected, according as the posterior or anterior tracks of the spinal cord are implicated. Retention or incontinence of urine, with obstinate constipation, or involuntary discharge of fæces, an alkaline state of the urine, and more or less of the symptoms already enumerated, will be present.

Besides the cancerous, the spinal meninges may be the seat of at least four kinds of tumours, viz., the simple fibrinous, the fibrous, tuberculous, and the acephalocystic.

Cancer of the Vertebræ.—We have already referred to the very important cases of Mr. Cæsar Hawkins (*loc. cit.*). Mr. Walshe has also given an interesting case of this form of disease affecting the lumbar vertebræ, in one of which it originated; and where, with the progress of infiltration, the bony tissue had disappeared, and the adventitious substance had destroyed the compact tissue, and protruded posteriorly under the dura mater into the spinal canal, and anteriorly under the anterior ligament. The cancerous product was composed of a fibrous stroma, having its fibres arranged almost rectilineally, and containing creamy, sanguineous pulp in its meshes, being of the scirrho-encephaloid species. The cases described by Sir Astley Cooper, Mr. Brodie, and Mr. Hawkins, were all of a similar kind, involving the cancellated tissue of the vertebræ, and of a true encephaloid character. M. Sanson (*Arch. Gén. de Méd.*, tome iv., p. 691) has described a case of general cancerous diathesis, in which almost every one of the vertebræ contained cancerous substances. It would seem to be the tendency of the cancerous disease, after having destroyed the bony structure, to grow in the direction of the spinal canal, pushing before it the dura mater, the bones being removed by interstitial absorption as the new material accumulates. The medulla and meninges undergo no alteration so long as the disease is confined to the bony structure; but when it makes its way into the spinal canal, it may contract adhesions to the dura mater, and press on the cord, causing atrophy and paralysis. These cases, as already remarked, are extremely rare. (*See Bibliog.*)]

203. *d.* The *symptoms* produced by morbid growths and alterations of structure in the spinal cord and its membranes, or by tumours developed in the vicinity, are generally those which indicate a slowly increased pressure on the cord, or a slowly advancing interruption of the functions of this organ. They are rarely such as enable us to distinguish the nature or the particular kind of lesion producing the interruption, unless a tumour of sufficient size be formed in the vicinity, and even then the information is only partial. As in cases of *softening*, *induration*, or *atrophy* of portions, or of a considerable extent of the cord, the

lesions now being considered produce phenomena which vary much with the region in which they are seated, with the nature and extent of the lesion, and with various concurrent or consecutive changes. When the organic lesion is seated in the lumbar region, and is only slightly developed, so as neither to compress nor destroy part of the organ, there are numbness or pain, prickings, twitchings, insensibility, and difficulty of motion of the lower extremities, or even of one lower extremity only. In proportion as the disease compresses or destroys both sides of any portion of the cord, hemi-paraplegia increases and extends, and complete paraplegia is developed. At last, after a longer or shorter time, according to the nature and progress of the lesion, paraplegia becomes more complete, there being loss of motion, sometimes of feeling also, of the lower limbs. Micturition and defæcation, at first difficult, become almost impossible. The catheter is constantly required, as well as the most active purgatives, which are often without effect, inflaming merely the bowels. The patient thus drags on a miserable existence, till at length escars form in the parts subject to pressure, and infiltration of the extremities and loose cellular tissue, and various consequent affections, chiefly suppression of the excretions and absorption of morbid matters, supervene, and terminate life by contaminating the circulation.

204. When the structural lesion is seated in the dorsal region of the cord or of its membranes, or spine itself, the above phenomena are often attended by difficult respiration, owing to impeded action of the inspiratory muscles from impaired influence of the intercostal nerves. And when the cervical portion of the cord is affected, besides the preceding lesions of function, the superior extremities, and even the voice, and speech, and muscles of deglutition, slightly participate in the paralytic disorder. The whole train of symptoms is often attended at first by little pain in the parts of the spine affected, unless when the lesion is cancerous. These formations are generally developed, more or less slowly, without any symptoms of vascular reaction or febrile commotion; but contractions of, or spasms, or pains in, the limbs, and severe pains in corresponding regions of the trunk with the seat of disease, are very generally experienced during the more advanced stages.*

205. *c.* But little can be said respecting the *diagnosis* of the above lesions with any truth or

* The following cases, more or less abridged from the original reports, will illustrate the history of the lesions now considered:

i. *Fibrous Tumour in the Theca Vertebralis.*—A female, aged thirty-five, felt pain in the back and side, and was very sensible of cold in her legs; the left foot and ankle soon afterward becoming weak, cold, heavy, with impaired power of locomotion. Two months afterward the right leg was similarly affected; these sensations, with numbness, now extending up to her loins. Her gait was unsteady, but there was no tenderness along any part of the spine. Five months after the first symptoms, she had darting pains in the knees, aching in the loins, and great difficulty in walking. Sensation was impaired. She had cramps in her legs. In about twelve months, she could not stand, involuntary movements of the lower extremities occurred, and she voided urine with difficulty. Fourteen months from the commencement of disorder, sensation and motion of the lower limbs were abolished, but the urinary bladder expelled its contents. Four years from the invasion, any attempt to move caused cramps of her whole frame. She had severe pain in the back and lower part of the body. Both limbs were very cold, and the right was much swollen. Five years from the date of disorder, no sensation or motion existed below the loins, but tickling the soles of the feet produced involuntary movements. She lived upward of seven years from the invasion of the paralysis.

On *inspection* after death, the body was much emaciated, extensive sloughing existing over the sacrum and hips. The brain was healthy. "At the lower dorsal portion of the spinal cord, there was a tumour, involving the substance of the cord, about the size of the last joint of a man's forefinger. It was of firm consistence, and osseous where it sprung from within the dura mater, opposite the eleventh dorsal vertebra, to the depth of a quarter of an inch, and fibrous, with rough granular matter intermixed, in the rest of its structure. Its distinct round form compressed, and was firmly attached to the arachnoid and spinal cord itself, so as to cut into and flatten the nervous substance of the cord. For about two inches below the tumour the cord was much softened, and a little behind its centre was a canal, half an inch long, within its neurine."—(Smith and Ewen, *in Reports of Pathol. Soc. of Lond.*, 1847 and 1848, p. 160.)

ii. *Tubercles in the Spinal Marrow.*—A laundress, in a delicate state of health for some time previously, complained of pains in the back and lower extremities, with impaired power in her legs. After some weeks, she complained of tingling and pricking pains, and a fortnight afterward she had complete paraplegia, both sensation and motion being simultaneously destroyed. She now began to suffer severely from spasmodic contraction of the muscles, chiefly when about to fall asleep, or when the legs were touched or shifted in bed. The knees were then rigidly bent and drawn up to the abdomen. The introduction of the catheter into the bladder produced the spasms. The bowels were constipated; but after the action of medicine she could not retain the fæces. She had catching pains, with spasms in the lower ribs and hypogastrium, and pain in the lumbar region, with slight projection of one of the spinous processes. A slough formed on the sacrum; bronchitis supervened, and she died, about three months from the invasion of paralysis.

The *examination, post mortem*, displayed the membranes of the spinal cord in a healthy state; "but at two points, the upper one opposite to the eighth, and the lower to the twelfth dorsal vertebra, the spinal marrow was slightly swollen into a globular form, and felt hard; the surface, in colour, texture, and vascularity, remaining unchanged. On making a longitudinal section of the upper swelling, an oval mass of tubercular matter, three quarters of an inch in length, and about the same diameter as the spinal marrow, of the firmness of a lymphatic gland, of uniform structure, and of a pale green hue, was seen to occupy the whole interior of the organ, and was invested all round by a thin layer of medullary matter. The structure of the spinal marrow immediately adjoining the morbid growth appeared sound. The swelling a few inches lower down was caused by a similar circumscribed mass of tubercular matter, contained in the interior of the cord, but it was smaller in size. In the left crus cerebelli, close to the pons Varolii, and about its middle, another tubercular tumour, in colour and size not unlike the kernel of a hazel-nut, was found imbedded in the substance of the crus, at the depth of a quarter of an inch from the surface, the adjacent medullary matter being quite healthy. There was also a tumour of the same structure, and of the size of a pea, in the left hippocampus minor. Tubercles were scattered through both lungs," &c.—(Mr. Shaw, *in Ibid.*, 1848 and 1849, p. 24.)

iii. *Cancerous Tumour in the Spinal Canal.*—A man, aged forty-six, of intemperate habits, could not sit erect without support. There was complete loss of voluntary power below the pelvis, and total anæsthesia in the right leg. He could feel pinching in the left. Reflex action was slowly produced by severe pinching, which easily excited erythema. There was a tenderness over all the lower dorsal vertebræ. The paralysis afterward invaded successively the abdominal muscles, and the bladder and arms, so that for some weeks before death, loss of sensation and voluntary motion was complete below the chest. Slight reflex action of the legs could be produced by severe pinching. Convulsive attacks preceded death.

On *examination*, the body was much emaciated. "The brain and membranes were healthy. Within the spinal canal, closely adherent to the theca externally, there existed an irregular encephaloid mass, mottled with dark spots, extending from the third to the sixth dorsal vertebræ, the bodies of which were carious, and infiltrated with cancerous matter. The tumour extended outward between the spines of the vertebræ and muscles to near the integuments. The portion of the cord beneath it was flattened, soft, and wasted. An ounce of fluid was contained beneath the arachnoid below the tumour." Cancerous matter was found also in the lungs, liver, heart, and pancreas.—(Dr. C. J. B. Williams, *in Ibid.*, 1846 and 1847, p. 43.)

iv. *A fibro-carcinomatous Tumour invading the Spinal Canal, &c.*—A young lady had a tumour firmly attached

precision. It has been supposed that scirrhus, or cancer, involving the cord or its membranes, will be indicated by lancinating pains occurring at intervals, especially towards the close of the disease, by a straw yellow tint of the skin, by the presence of the same disease in other parts of the body, and by the advanced age of the patient, as it seldom appears until after the meridian of life. But, although these indications are generally observed, they are not always present. Tubercles can be inferred to be the cause of the symptoms characteristic of organic lesions of the spinal cord only when their existence in other organs or parts have been or are manifested; and when the early age of the patient, the scrofulous taint, and the absence of inflammatory symptoms farther aid this inference. The syphilitic cachexia, and the existence of osseous tumours externally, may suggest the presence of similar tumours in the spinal canal; but of this there is rarely any evidence; a supposition only can be entertained.

206. *f.* The *prognosis* in the above states of disease is always unfavourable. No correct idea even can be formed as to the term of their duration. After the paraplegic symptoms or spasms, which they produce, have appeared, a few days only may be the term of existence; or life may be prolonged for several years, as in the cases which I have here adduced. When the lesion is seated in the upper regions of the cord or its membranes, the duration of the disease is generally much shorter than when it is seated in the lumbar region.

207. *g.* The *treatment* of the structural changes just considered cannot be directed with much advantage, even if the nature of these changes were sufficiently manifest; but in most cases we proceed in the dark, although in some instances more or less light breaks upon our path. Yet, whatever may be the particular lesion in this quarter that we may be required to combat, there is one indication which should always guide our steps, and this is to support the vital resistance to the extension of disease. There are very few organic changes which are not increased by inflammatory action, on the one hand, and by debility—by impaired constitutional power, on the other. We should, therefore, endeavour to improve the general health by promoting the digestive, the assimilating, and the excreting functions, and by removal to a dry, pure, and temperate air; avoiding excitement, and all sources of physical and mental irritation. It may sometimes be requisite to support the strength, and for this purpose such medicines as have the effect may be given with those which are most likely to procure the absorption of morbid growths, or to arrest their progress. With these intentions, the bitter infusions may be given with small doses of the iodide of potassium and the solution of potash, or the carbonates of potash, or Brandish's alkaline solution; and to these the preparations of sarza may be added; or, as circumstances may suggest, the iodide of iron may be given in the sirup of sarza. In many cases, the chief manifestation of disease—the paralysis produced by the organic change, will either be treated empirically or removed from the care of the scientific physician; and, although certain of the means thus employed may be more or less beneficial, especially electricity, galvanism, and electro-magnetism, yet they may be injurious, in some cases, when prescribed without due discrimination. Whenever the paralytic symptoms are attended by spasms or spastic contractions, then these are hazardous means; and the same may be stated respecting nux-vomica, strychnine, and phosphorus. But it is unnecessary to add to what I have advanced above, (§ 173, *et seq.*), or to what has been adduced respecting the *treatment of* Paralysis.

Bibliog. and Refer.—1. Diseases of the Spinal Column, its Cord, or its Membranes generally.—*Aretæus*, De Morb. Diut., cap. vii.—*Galen*, De Symptomatum Causis, lib. i. et De Locis Affectis, l. iii., cap. viii.; liv. iv., cap. iv.—*F. Hoffmann*, Med. Ration., p. 14.—*P. Jones*, Essay on Crookedness or Distortion of the Spine, 8vo. Lond., 1738.—*J. B. Winslow*, in Mém. de l'Acad. des Sciences, p. 59. 1740.—*Levacher*, in Mém. de l'Acad. Roy. de Chirur., t. iv. 1768.—*Ludwig*, Tract. de Doloribus ad Spinam Dorsi, in Adversaria Medico-Pract., t. i., par. 4, p. 711. 1770.—*J. P. Frank*, De Vertebralis Columnæ in Morbis Dignitate Oratio, Paviæ, 1791; et Epitome de Curand. Hom. Morbis, l. ii.—*Guyenet*, Dissert. sur quelques Maladies, qui affectent la Colonne Vertébrale. Montpel., 1809.—*J. Abercrombie*, On Paralysis of the Lower Extremities from Diseased Spine, 8vo. Edinb., 1804.—*Hœfner*, Diss. de Medullæ Spinalis Inflammatione. Marbourg, 1779.—*V. L. Brera*, Della Rhachialgite Cenni Pathologici, 4to, p. 30. Livourne, 1810.—*Desfray*, Essai sur le Spinitis, ou Inflammation de la Moëlle de l'Epine, 4to, Thèse. Paris, 1813.—*C. F. Harless*, Praktische Bemerkungen über die Myelitis, in Harless, Jahrbücher, t. ii., p 260. 1813.—*Heer*, Diss. de Inflammatione Medullæ Spinalis. Erlangen, 1814.—*T. Copland*, Observations on the Symptoms and Treatment of the Diseases of the Spine, 8vo. Lond., 1815.—*V. Rachetti*, Della Struttura, delle Funzioni e Malattie della Midolla Spinale. Milan, 1816.—*H. W. A. Asch*, De Vitiis quibusdam Medullæ Spinalis minus cognitis. Hall, 1816.—*Barbarous*, Diss. de Medullæ Spinalis Inflammatione, 8vo. Turin, 1818.—*J. Frank*, De Morbis Columnæ Vertebralis in Genere; De Rachialgia—De Rachialgitide, in Praxeos Med. Univ. Præcepta, p. ii., t. i., sect. 2, cap. 1, 2, and 3.—*M. Funk*, Die Rückenmarks-Entzündung, 3d edition. Bamberg, 1819.—Ibid., 8vo. 1832.—*Bergamaschi*, Sulla Mielitide Stenica, e sul Tetano; loro Identità, Metodo di Cura, e Malattie secondarie che ne derivano, 8vo. Pavie, 1820.—*Clot*, Recherches et Observations Pathologiques sur les Spinitis, 4to, Thèse. Montpellier, 1820.—*Macari*, Mém. et Observations sur la Spinitis, ou Inflamm. de la Moëlle Epinière, in Ann. de la Soc. de Méd. Pract. de Montpellier, t. ii., p. 5.—*S. Pinel*, Sur l'Inflammation de la Moëlle Epinière, in Journ. de Phys. de Magendie, t. i., p. 54.—*W. Earle*, Some Observations on Diseases of the Spine, in Philos. Transact., p. 2. 1822.—*Klokes*, Diss. de Mielitide. Hall, 1820. Transl. into Hufeland's Journ., 1823, lvi. and lvii.—*J. L. Casper*, Ueber die Verletzungen des Rückenmarks, in Hinsicht auf ihr Lethalitätsverhältniss (Extr. from Rust's Magazine, 1823), 8vo. Berlin, 1823. Trans. in Journ. complém. des Sci. Méd., t. xvi., p. 309, under this title: Sur les Lésions de la Moëlle Epinière, par Rapport à leur Degré de Léthalité.—*Gendrin*, Recherches sur les Tuber-

between the angle of the eighth rib and the spinous processes of the vertebræ on the left side. It was hard, painless, and immovable, and of the size of a large orange. Five months afterward she had weakness and numbness of the legs, so that she could not stand. On the following day she was completely paraplegic; and on the day after this, she passed her motions involuntarily, and there was retention of urine. She afterward had cough, rigours, profuse perspiration, shortness of breath, and quick pulse. She had a slight convulsive fit, and soon afterward expired—four days from the appearance of paralysis.

After death, this tumour was found to be composed of carcinoma fibrosum, and was very dense. The arches of the dorsal vertebræ and the spines were next raised, and upon the visceral surface of the fourth and fifth, a growth somewhat similar to the external one, and of such a size as to contract considerably the calibre of the vertebral canal, was discovered. "This growth resembled carcinoma, although somewhat lobulated. Opposite to this the theca was congested, although its normal contour was preserved. Upon opening the theca posteriorly, in the centre, the veins on the posterior surface of the cord were turgid, and the cord itself was a little flattened. When the anterior portion of the theca was divided in the centre, and reflected laterally, the anterior columns seemed to fall spontaneously on either side, and to expose the gray matter of the medulla, which was of a darker tint than usual, and very soft. This softening extended about an inch." The left thoracic cavity was invaded by a tumour corresponding with that in the dorsal region outside.—(Mr. A. Key, *in Ibid.*, 1848 and 1849, p. 25.)

cules du Cerveau et de la Moëlle Epinière, in Ann. du Cercle Méd. de Paris ; et séparém., 8vo. Paris, 1823.—*L. Wolff*, Beobachtung einer Chronischen Entzündung des Rückenmarks mit ungewöhnlichen Ausgang nebst Bemerkungen darüber, 8vo. Hamburg, 1824.—*Stiebel*, Ueber Neuralgiâ Rachitica, und Symptom des Gegensatzes, in Rust's Magazine, t. xvi., p. 549. 1824.—*A. Velpeau*, Mémoire sur une Altération profonde de la Moëlle alongée, sans que les Fonctions Nerveuses aient été troublées, in Archiv. Gén. de Méd., t. vii., p. 52. 1825.—Obs. sur une Malad. de la Moëlle Epinière, tendant à démontrer l'Isolement des Fonctions des Racines sensitives et motrices des Nerfs, Ibid., p. 68.—Mémoire sur quelques Alterations de la Moëlle Epinière, Ibid., p. 329.—*G. F. Friederich*, Diss. de Myelitide. Berlin, 1825.—*Petronelli*, Observations et Réflexions sur quelques Lésions de la Moëlle Epinière, &c., 4to. Montp., 1826.—*Crouzit*, Recherches sur les Altérations de la Moëlle Epinière à la suite des Fièvres Adynamiques et Ataxiques, 4to, No. 139, Thèse. Paris, 1827.—*Fages*, Quelques Considérations sur les Lésions de la Colonne Vertébrale et de la Moelle Epinière, in Ephémérides Méd. de Montpellier. Février, 1827.—*Hutin*, Recherches et Observations pour servir à l'Histoire Anatomique, Physiologique et Pathologique de la Moëlle Epinière, in Nouvelle Biblioth. Méd. Février, 1828.—*Flourens*, Expériences sur la Réunion ou Cicatrisation des Plaies de la Moëlle Epinière et des Nerfs, in Ann. des Sc. Naturelles, t. xiii., p. 113. 1828.—*Calmeil*, Anatomie, Physiologie et Pathologie de la Moëlle Epinière, part 2. Pathol., in Journ. des Progr. des Sciences et des Instit. Méd., t. xii., p. 133. 1828.—*J. Abercrombie*, Pathological and Practical Researches on the Diseases of the Brain and Spinal Cord, 8vo. Edinb., 1828.—Ibid., 8vo. 1830.—*J. F. Dezeimeris*, in Archives Génér. de Méd., t. xvi., p. 40.—*C. Brown*, On Irritation of the Spinal Nerves, in the Glasgow Med. Journ., No. 11 ; 1828. Extr. in Archiv. Gén. de Méd., t. xix., p. 423.—*J. R. W. Dunbar*, An Essay on the Structure, Functions, and Diseases of the Nervous System, 8vo, p. 77. Phil., 1828.—*Darwall*, Observations on some Forms of Spinal and Cerebral Irritation. 1829.—*E. Enz*, Beobachtung über mehrere der Symtomatischen Krankheitsformen, welche bei Empfindlichkeit einer grösseren oder kleineren Stelle der Wirbelsäule vorkommen, in Rust's Magaz., t. xli., p. 195, and t. xliv., p. 43 and 204.—*Bouley*, Des Maladies de la Moëlle Epinière et de ses Enveloppes chez le Cheval, in Recueil de Méd. Véter. 1830.—*R. Leonhardi*, Diss. de Myelitide, 8vo. Leipzig, 1830.—*J. Parrish*, On Irritation of the Spinal Marrow as connected with Nervous Diseases, in the American Journ. of the Med. Sci., August, 1832 ; and Trans. in Archiv. Gén. de Méd. 2me sér., t. i., p. 388.—*W. Griffin* and *D. Griffin*, Observations on the Functional Affections of the Spinal Cord and Ganglionic Nerves, &c., 8vo. London, 1834. Anal. in Medico-Chirurg. Review, No. xliii., p. 1.—*Albers*, Die Entzündung der harten Haut des Rückenmarks, Perimeningitis Medullæ Spinalis, in Journ. der Chirurgie of Graefe and Walter, t. xix., p. 347. 1833. Extr. in Gaz. Méd., p. 857. 1833.—*Hache*, Affections de la Moëlle Epinière et de ses Membrances, in Jour. Hebdom., t. xi., p. 269. 1833.—*Duparque*, Remarques et Observations sur les Maladies de la Moëlle Epinière, in Transact. Médic. Jan., 1833.—*J. Cruveilhier*, Maladies de la Moëlle Epinière, in Anat. Pathol. du Corps humain, livr. iii., vi., xvi. 1833.—*W. Coulson*, On Deformities of the Chest and Spine, 2d ed., 8vo. Lond., 1837.—*Monod*, De quelques Maladies de la Moëlle Epinière, in Bullet. de la Soc. Anat., No. 18.—*E. Stanley*, in Lond. Medico-Chirurg. Transact., t. xviii., pt. 1, p. 260. Ext. in Archives Gén. de Méd., 2me sér., t. v., p. 95. 1832.—*J. P. Teale*, A Treatise on Neuralgic Diseases, 8vo. Lond., 1829.—*R. Stafford*, On Injuries, Diseases, &c., of the Spine, 8vo. Lond., 1832.—*J. Marshall*, Practical Observations on Diseases of the Heart, Lungs, Stomach, Liver, &c., occasioned by Spinal Irritation, 8vo. Lond., 1835.—*E. Constantin*, De la Myélite, 4to. Paris, 1836.—*R. B. Todd*, in Cyclop. of Pract. Med., t. iv., p. 635.—*Colliny*, Quelques Observations de Maladies de la Moëlle Epinière et de ses Membranes, in Archiv. Gén. de Méd., 2me série, t. x., p. 209. 1836.—*Grisolle*, Observations de Maladies de la Moëlle Epinière, in Journ. Hebdom., No. 3. Jan., 1836.—*G. C F. Melber*, De Medullæ Spinalis Erethismo, 8vo, p. 82. Francfort-sur-le-Mein, 1838.—*C. P. Ollivier*, De la Moëlle Epinière et de ses Maladies, contenant l'Histor. Anatom. Physiol. et Pathol. de ce Centre Nerveux chez l'Homme, 8vo. Paris, 1825.—Ibid., 8vo, 2 tomes, 1827 : et Ibid., 8vo, 2 tomes. 1837.—*Calmeil*, Dict. de Méd., 2d edit., art. *Moëlle Epinière*.—*Anon.*, in British and Foreign Med. Review, vol. iii., p. 3, *et seq.*—Descriptive Catalogue of Patholog. Specimens contained in the Museum of the Royal College of Surgeons of England, vol. ii., *series* xiv., p. 243 ; vol. iv., *ser.* xliii., p. 140 ; vol. v., *ser.* lxvi., p. 139.

ii. CURVATURES OF THE SPINE.—*G. Coopmans*, Disp. Med. de Cyphosi, 4to. Franeker, 1770.—*C. V. Roy*, De Scoliosi, 4to. Leyde, 1774.—*Watzel*, De Efficacia Gibbositatis in mutandis Vasorum Directionibus, fig. Utrecht, 1778.—*T. Sheldrake*, An Essay on the various Causes and Effects of the Distorted Spine, 8vo. Lond., 1783.—*A. Portal*, Observations sur la Nature et le Traitement due Rachitisme ou des Courbures de la Colonne Vertébrale, 8vo. Par., 1797.—*A. J. Venel*, Description de plusieurs nouveaux Moyens Mécaniques propres à prévenir, borner, et même corriger les Courbures latérales et la Torsion de l'Epine du Dos, 8vo. Lausanne, 1788.—*C. H. Wilkinson*, Essay on Distortion of the Spine, &c., 8vo. London, 1798.—*J. Earle*, Observations on the Cure of Curved Spine, in which the Effects of mechanical Assistance is considered, 8vo. Lond., 1805.—Reply to the Review of M. Baynton's Essay on the Cure of Crooked Spine, in the Edinb. Med. and Surg. Journ., t. xi., p. 35. 1815.—*T. Baynton*, An Account of a successful Method of treating Diseases of the Spine, 8vo. Bristol, 1813. Extr. in the Edinb. Med. and Surg. Journ., t. x.—*J. Macartney*, Observations on Curvatures of the Spine, 4to. Dublin, 1817.—*G. Malsch*, De nova Machina Græffiana Distortiones Spinæ Dorsi ad sanandas, necnon Disquisitio Deformitatum istium, 4to. Berlin, 1816.—*J. L. Choulant*, Dec. i. et ii., Pelvium Spinarumque deformatarum, adj. nonnullis Annotationibus, 4to. Leipzig, 1818-20.—*W. T. Ward*, Practical Observations on Distortions of the Spine, Chest, and Limbs, 8vo. Lond., 1819.—Ibid., 8vo. 1840.—*Vrolik*, Diss. de mutato Vasorum Sanguiferorum Decursu, in Scoliosi et Cyphosi, fig. Amsterdam, 1822.—*A. Dods*, Pathological Observations on the rotated or contorted Spine, 8vo. London, 1824.—*J. Shaw*, On the Nature and Treatment of the Distortions to which the Spine and the Bones of the Chest are subject, 8vo. London, 1822. Engravings illustrative of a work on the Nature and Treatment of the Distortions, &c. Ibid., 1824, in fol. Farther Observations on the lateral or serpentine Curvature of the Spine, 8vo. 1825.—*T. Jarrold*, Inquiry into the Distortions of the Spine, 8vo. Lond., 1824.—*W. T. Ward*, Pract. Observat. on Distortions of the Spine, 8vo. Lond., 1822.—*R. W. Bampfield*, Essay on Curvatures and Dist. of the Spine, 8vo. Lond., 1824.—*L. J. Begin*, Mémoire sur les Déviations du Rachis, 8vo. Paris, 1826.—*Pravaz*, Nouvelle Méthode pour le Traitement des Déviations de la Colonne Vertébrale, 8vo. Par., 1827.—Sur l'Application des Moyens Mécaniques au Redressement des Déviations de la Colonne Vertébrale, in Arch. Gén. de Méd., t. xvii., p. 296. 1828.—Note sur des nouveaux Moyens de rétablir la Régularité du Thorax, dans le Cas de Déviation latérale du Rachis, in Mém. de l'Acad. Royale de Méd., t. iii., p. 69, and t. iv., p. 201. 1833.—*C. Lachaise*, Précis Physiologique sur les Courbures de la Colonne Vertébrale, 8vo. Paris, 1827.—*J. C. Molk*, Considerations sur les Causes et le Traitement des Courbures de la Colonne Vertébrale, 4to. Strasbourg, 1828.—*N. D. Goussy*, Diss. sur les Déviations de la Colonne Vertébrale, 4to, Thèse. Paris, 1828.—*G. A. Loret*, Essai sur les Déviations de la Colonne Vertébrale, 4to, fig., Thèse. 1829.—*M. Mayor*, Mém. sur le Traitement des Gibbosités, in Journ. des Progrès des Sciences Médicales, tome xiii., p. 169. 1829.—*A. Vernière*, Sur un nouveau Moyen Orthopédique, propre à remplacer le Traitement généralement en Usage pour le Redressement des Courbures anormales de la Colonne Vertébrale, in Journ. des Progrès, t. xiv., p. 175. 1829.—*F. W. Heidenrich*, Orthopädie, oder die Verkrümmungen der Wirbelsäule, &c., 8vo, fig., forming the 2d part of his Orthopädie. Berlin, 1831.—*J. A. Gorachuchi*, De Incurvationibus Columnæ Vertebrarum abnormibus, 8vo. Vienne, 1831.—*L. Beale*, On the Distortions and Deformities of the human Body, with a concise View of the Nature and Treatment of the Malformations and Distortions of the Chest, Spine, and Limbs, 8vo, fig. Lond., 1833.—*Delpech* and *Trinquier*, Observations Cliniques sur les Difformités de la Taille et des Membres, 8vo. Montpellier, 1835.—*Bouvier*, Dictionnaire de Médecine et de Chirurgie Pratiques ; *art.* Vertébrale (Déviations de la Colonne), t. xv. 1836.—*Maisonabe*, Mémoire établissant l'Incurabilité de la Déviation latérale droite de la Colonne Vertébrale, 8vo, fig. Paris, 1837. See also his Journal des Deformités.—*Vallin*, De la Torsion qui accompagne constamment les Déviations latérales de l'Epine, 8vo, p. 46. Nantes, 1837.—*J. Guérin*, Mémoire sur l'Extension Sigmoïde et la Flexion dans le Traitement des Déviations latérales de l'Epine, 8vo. Paris, 1839.—Mém. sur les Déviations simulées de la Colonne Vertébrale, &c.—Ibid., 8vo. 1839.—Sur le Traitement des Déviations latérales de l'Epine par la Section sous-entomée des Muscles du Dos et de la Colonne Vertébrale, in Gaz. Méd. de Paris, p. 403. 1839.—Mém. sur l'Etiologie Génér. des Déviations latérales de l'Epine par la Rétraction musculaire active, Ibid., p. 369. 1840.—*J. B. Serny*, Spinal Curvature, its Consequences, and its Cure, &c., 8vo. Lond., 1840.—*J. Amesbury*, Practical Remarks on the Causes, Nature, and Treatment of Deformities of the Spine, Chest, and Limbs, muscular Weakness, weak Joints, muscular Contractions, and stiff Joints, &c., 4to. Lond., 1840.—*E. W. Tuson*, The Cause and Treatment of Curvature of the Vertebral Column, 8vo, p. xiii.-283,

and pl. xxvi. Lond., 1841.—*F. Sibson*, Effects of Curvature of Spine on the respiratory Movements, in Trans. of Med. and Chirurg. Soc., vol. xxxi., p. 379.—*Taverner*, Considérations Pratiques sur les Déviations, ou Déformations de la Taille, in Journ. des Connaissances Médicales Pratiq., t. vii., p. 297–831. 1840.—*G. Childs*, On lateral Curvature of the Spine, 8vo. London, 1841.—*V. Duval*, Des Déviations de la Colonne Vertébrale, in Revue des Spécialités Médicales et Chirurgicales. 1840–42.—*E. Chassaignac*, De l'Appréciation des Appareils Orthopédiques. Thèse de Concours, 4to. Paris, 1811.—*Chailly* and *Godier*, Précis de la Rachidiorthosie, 8vo. Par., 1842.—*Wenzel*, Ueber die Krankheiten am Rückgrathe, fol., fig. Bamberg, 1824.—*R. W. Bampfield*, An Essay on Curvatures and Diseases of the Spine, 8vo. Lond., 1827.—*Delpech*, Traité de l'Orthomorphie, t. i., p. 200.—*Jalade-Lafond*, Recherches Pratiques sur les Princip. Difformités, &c., 2d Partie, p. 142. Paris, 1829.—*J. Coles*, On Spinal Affections, and the prone System of treating them, 12mo, 2d ed. 1847. (*Curvatures merely.*)—*E. Harrison*, Pathol. and Pract. Observations on Spinal Diseases, 8vo. London, 1827. (*Neither pathological nor practical, and treating most empirically of curvatures merely.*)—*C. Dyfin*, On Deformities of the Spine, &c., 2d ed., 8vo. 1835.—*C. Harrison*, On Deformities of the Chest and Spine, 8vo. 1842.—*S. Hare*, On Curvatures of the Spine, 2d ed., 8vo. London, 1844.—*J. Robertson*, On Spinal Diseases, with an improved Plan of Cure, 8vo. 1841.—On Spinal and Nervous Diseases, &c. 1841.—*F. Skey*, On Curvature of the Spine, 8vo. Lond., 1840.—*R. Stafford*, Essays on Diseases of the Spine, 8vo. London, 1844.—*R. W. Tamplin*, Lectures on the Nature and Treatment of Deformities, &c., 8vo. Lond., 1846.—On Curvatures of the Spine, p. 204, *et seq.*—*E. Lonsdale*, Observations on the Treatment of lateral Curvature of the Spine, 8vo. London, 1847.—*J. Bishop*, The Causes and Treatment of Deformities of the human Body, 8vo. Lond., 1852. (*A most able and philosophical work.*)

iii. Inflammat. and Caries of the Vertebræ.—*P. Pott*, Remarks on the Palsy of the Lower Limbs, which is frequently found to accompany a Curvature of the Spine, 8vo. Lond., 1778.—Farther Remarks, &c., being a Suppl. to the former, &c., 8vo. Lond., 1782.—*Paletta*, Sulla Paralitica, in Adversar. Chir. Primar., p. 139; et Exercit. Pathol. de Tuberc. Spinæ, p. 104.—*G. Gibb*, Select. of Cases of the Disorder commonly termed Paralysis of the Lower Extremities, 8vo. London, 1782.—*Loder*, Chirurg. Medic. Beobachtungen, b. i., p. 251.—*J. P. Frank*, De Cur. Hom. Morbis, l. ii., p. 48.—*B. C. Brodie*, in Med. and Chirurg. Transactions, vol. iv., p. 263.—*A. Dugès*, Malad. de la Moëlle Epinière, t. i., p. 388.—*C. Hawkins*, Medico-Chirurg. Review, No. xliii., p. 557.—*Malle*, Clinique Chirurg. de l'Hôp. d'Instruct. de Strasbourg, 8vo, p. 105. Paris, 1838.—*Stannius*, in British and Foreign Med. Review, vol. iii., p. 222.—*H. Nasse*, in ibid., vol. iv., p. 415.—*G. B. Wood*, A Treatise on the Practice of Medicine, 2d edit., in two vols., 8vo. Philadelphia, 1849; vol. ii., p. 728.

iv. Exostosis, Anchylosis, Ossifications, &c.—*Columbus*, De Re Anatomica, l. xv., p. 484.—*A. Portal*, Traité du Rachitis, p. 211. Paris, 1797.—*Sandifort*, Exercit ac. Acad., l. ii., p. 1; et Museum Anatom., vol. i., p. 147, *et seq.*—*Voigtel*, Handb. du Path. Anat., b. i., p. 223.—*A. Key*, in Guy's Hospital Reports, vol. iii., p. 17.—*Prus*, in Revue Méd., t. iv., p. 392. 1840.—*J. C. Warren*, Surg. Observat. on Tumours, 8vo. Boston, 1839.—*A. Duges*, Op. cit., t. i., p. 395.

v. Morbid States of the Spinal Membranes.—*J. P. Frank*, De Vertebralis Columnæ in Morbis Dignitate. Paviæ, 1791.—*J. B. Mayer*, De sano et morboso Medullæ Spinalis Statu. Vindeb., 1808.—*Brera*, Della Rachialgite Cenni Patholog., &c.—*Lallemand*, Lettres sur l'Encéphale Obs., No. 50, p. 305.—*J. Copland*, Of the Causes, Nature, and Treatment of Palsy and Apoplexy, 8vo. London, 1850. (*Adhesions between the membranes more or less organized, and fatty degeneration of the false membrane.*)

vi. Cartilaginous and ossific Concretions in.—*Chaussier*, Bullet. de la Faculté de Méd., t. v., p. 154.—*Esquirol*, Ibid., p. 426.—*Horn*, in Archiv. für Med., p. 237. Erfahrung, 1813.—*I. F. Meckel*, Hand. der Menschlichen Anatomie, b. iii., p. 603.—*Brayne*, in Lond. Med. Reposit. July, 1820.—*Myself*, in two Cases of Tetanus.—*Velpeau*, Archives Génér. de Méd., 1825; and in *Magendie's* Journ. de Physiol., p. 138. 1826.—*Ollivier*, p. 344.—*R. B. Todd*, in Cyclop. of Pract. Med., vol. iv., p. 641.

vii. Hydatids, Tubercles, and Malignant Tumours of Spin. Memb.—*Lieutaud*, Hist. Anat., t. i., p. 391.—*Esquirol*, ut supra, p. 426.—*Chaussier*, Journ. de Médecine contin., t. xiv., p. 231.—*Reydellet*, in Dict. des Sciences Méd., t. xxxiii., p. 564.—*Ollivier*, Traité, &c., t. ii., p. 520, *et seq.*, 3d edit.—*Cruveilhier*, Anat. Pathol., livr. xx., p. 3.—*C. Hawkins*, in Transact. of Medical and Chirurgical Soc., vol. xxiv., p. 45.—*Lallemand*, Op. cit., Lettre v., p. 341.—*Velpeau*, in Archives Génér. de Méd., No. i. 1826.—*Abercrombie*, On the Brain and Spinal Cord, &c., p. 371.—*Wittfeld*, in *Horn's* Archiv. May and June, 1828.—*Knox*, in Lond. Med. Observ. and Inq., vol. iii., p. 160.—*Reid*, in Transact. of King's and Queen's College of Physicians in Ireland, vol. i. Also, other authorities adduced by *Plouquet* and *Otto*.

viii. Lymph and various Fluids effused between the Memb.—*Bonnet*, Sepulchret. Anatom., l. i., sect. ii., p. 84.—*Morgagni*, Epis., iii., 2.—*Bell*, in Edinb. Med. Comment., vol. iii., p. 87.—*Albers*, in Medico-Chirurg. Review, No. xliii., p. 227. (*Inflammation, &c., of spinal dura mater.*)—*Hard*, in Dict. des Sciences Méd., *art. Hydrorhachis.*—*J. P. French*, De Curandis Hom. Morbis, l. vi.—*Ollivier*, p. 248.—*Abercrombie*, p. 358.—*Denmark*, in Trans. of Med. and Chirurg. Soc., vol. v.—*Chevalier*, in Ibid., vol. ii., No. 9.—*J. Copland*, in London Medical Repository, vol. xv. (*After metastasis of rheumatism, lymph and adhesions between the membranes.*)

ix. Morbid States of the Cord itself.—*L. C. Treviranus*, Zeitschrift für Physiol., b. iii., p. 1, p. 3.—*V. Racchetti*, Della Struttura, delle Funzione delle Mallatie della Midolla Spinale. Milano, 1816.—*Asch*, De Vitiis quibusdam Medullæ Spinalis minus cognitis, 4to. Halæ, 1816.—*Ollivier*, Opus citatum, 2d edit. Paris, 1827.—*E. Stanley*, in Trans. of Med. and Chirurg. Soc., vol. xxiii., p. 80.—*J. Webster*, in Ibid., vol. lxvi., p. i.—*Rolando*, Rev. Méd., t. iv., p. 316. 1824.—*Fallot*, in Archives Génér. de Méd., t. lvii., p. 96.—*Albers*, in British and Foreign Med. Review, vol. v., p. 183. (*Softening of central gray substance.*)—*Hutin*, in Nouvelle Biblioth. de Méd. Jan. et Fév., 1828.—*R. B. Todd*, Op. cit., vol. iv., p. 643.

x. Atrophy of, &c.—*Myolophthisis.*—*Brendel*, De Tabe Dorsuale. Goet., 1749.—*Loewenhard*, De Myelophthisi Chronica vera et notha, 8vo. Berlin, 1812.—*W. Plouquet*, Exemplum singularis Morbi Paralytici. Tubing., 1806.—*Scheemer*, Tabis Dorsualis Adumbratio Pathologica. Ber., 1817.—*G. Horn*, De Tabe Dorsuali Præiusio, 4to. Ber., 1827.—*Magendie's* Journ. de Physiol., t. iv., p. 372.—*Howship*, Practical Observ. in Morbid Anatomy, 8vo, p. 59.—*Latham*, in London Med. and Phys. Journ., New Series, vol. i. July, 1826.—*Calmeil*, in Journ. des Progres des Sc. Méd., t. ii., p. 81.—*Ollivier*, Op. cit., t. i., p. 416–441; t. ii., p. 444, 3d edit.

xi. Changes in the Consistence of the Marrow.—*Morgagni*, Epist. lxx., 5.—*J. P. Frank*, De curandis Hom. Morbis, l. ii., p. 49.—*Portal*, Cours de Anatom. Médicale, t. iv., p. 111. (*Induration of.*)—*Horn*, Archiv. f. Medic. Erfahr., &c., p. 838. 1815.—*Calmeil*, Sur la Structure, les Fonctions, le Ramollissement de la Moëlle Epinière, 8vo. Paris, 1828.—*Georget*, De la Folie, p. 492. Paris, 1820.—*Rostan*, Recherches sur Remollissement du Cerveau. Paris, 1820. (*Six cases of softening of the spinal marrow.*)—*Pinel*, *Magendie's* Journ. de Physiol., t. i., p. 154; et *Rullier*, Ibid., t. iii., p. 173. (*Uncommon softening.*)—*Royer-Collard*, Ibid., t. iii., p. 157.—*Serres*, Ibid., t. v., p. 254.—*Ollivier*, Op. cit. cases, 43–46, 48, and 50, 1st edit.; t. ii., p. 356, *et seq.*, 3d edit.—*Louis*, Mémoires sur l'Anat. Patholog., p. 410. Paris, 1826.—*Jeffreys*, Lond. Med. and Phys. Journal. July, 1826.—*Molison*, in Transact. of Med. and Chirurg. Society of Edin., vol. iii., p. 1, p. 173.—*Lallemand*, Recherches sur l'Encéphale et ses Dépendances, Lettre ii., p. 309.—*Gendrin*, Histoire Anatom. des Inflammations, t. ii., p. 150.—*Bergameschi*, Sulla Mielitide Stenica, &c. Pav., 1820.—*Velpeau*, Révue Médicale, &c., t. ii., p. 247.

xii. Inflammation, Abscess, Gangrene, &c.—*Hæfner*, De Inflammatione Medullæ Spinalis. Marb., 1799.—*Niel*, Sur le Spinitis, in *Corvisart's* Journ. de Méd., p. 203. Oct., 1812.—*Brera*, Della Rachialgite Cenni Pathologici, in Atti dell' Academia Ital. di Scienz. Lit. e Art., vol. i., p. 1, p. 246. Livorn., 1810.—*Bargamaschi*, Osservazioni sulla Inflammatione della Spinale Medulla, &c., 4to. Pavia, 1810.—*Gräf*, De Myelitidis Nosographia, 4to. Reg., 1823.—*Meniere*, in Archives Génér. de Méd. Dec., 1828.—*Renauldin*, Dict. des Sciences Médicales, t. xxii., p. 247.—*Hart*, in Dublin Hosp. Reports, vol. v., p. 522.—*Thomson*, in Edinb. Medical and Surg. Journ., No. lvii. 1818.—*Desportes*, in Revue Médicale, t. i., p. 253. 1825.—*Brière*, Nouv. Biblioth. Méd., t. ii., p. 187. 1826.—*Bouillaud*, Journ. Hebdom. de Méd., t. i., p. 227.—*Potain*, in Archives Génér. de Méd., t. xiii., p. 286.—*Honorè*, in Ibid., t. xiv., p. 412.

xiii. Tubercles, Tumours, &c.—*Phillips*, New London Med. Journ., vol. i., p. 144.—*Loewenhard*, De Myelophthisi Chronica vera et notha, 8vo. Berlin, 1817.—*Cerutti*, in Anat. Pathol. Museum, t. i., p. 11, p. 23, pl. 10.—*Velpeau*, in Archives Génér. de Méd. Jan., 1825.—*Williams*, in Report of Proceedings of the Pathological Society of London, vol. i., p. 43.—*A. Shaw*, in Ibid., vol. i., p. 25.—*A. Key*, in Ibid., vol. i., p. 27.

xiv. Apoplexy of the Marrow.—*Hutin*, in Bibliothèque Médicale, t. i., p. 170. 1828.—*Cruveilhier*, Anatomie Pathologique, livr. 3. Paris, 1828.—*Abercrombie*, On Diseases of the Brain and Spinal Cord, p. 362.—*Ollivier*, Opus citatum, t. ii., p. 116, 3d edit.—*Gaultier de Claubry*, Journ. Gén. de Méd. 1808.—*Chevalier*, Trans.

of the Med. and Chirurg. Soc., vol. iii., p. 102.—*Talbot*, Archives Gén. de Méd., t. xxiv., p. 438.—*Bouillaud*, in Journ. Hebd. de Méd., t. ii., p. 50. 1825.—*Anon.*, Case of Apop. of Spinal Cord, in Arch. Génér., &c., t. xxi., p. 429.—*Curling*, in Report of Proceedings of the Pathological Society of Lond., vol. i., p. 29.—*J. Copland*, Op. cit., p. 62.

[xv. Cancer of the Spinal Cord, Meninges, and Vertebræ.—*Cruveilhier*, Anat. Pathologique, livr. xx., art. Os; Idem., livr. xxxiii., Malade de la Moëlle, p. 6. 1839.—*C. Hawkins*, Med. Chir. Trans., vol. xxiv., p. 45. 1841.—*Lecat*, Traité de l'existence du Fluide des Nerfs, p. 53. Paris, 1753.—*Philips*, New London Med. Journ., vol. i., p. 144. 1792.—*N. Knox*, Lond. Med. Observ. and Inquiries, vol. iii., p. 160. 1767.—*R. Reid*, Transac. of King's and Queen's Coll. of Phys. in Ireland, vol. i., p. 120. 1817.—*Serres*, Anat. Comp. du Cerveau, tome ii., p. 234.—*Velpeau*, Arch. Gén. de Méd., tome vii., p. 68. 1825.—*Wolff*, Bull. des Sci. Med. de Ferussac. Jan., 1826.—*Ollivier*, Traité de la Moëlle Epinière, p. 736. 1827.—*Calmeil, loc. cit.*—*W. W. Fisher*, Prov. Med. and Surg. Transactions, vol. x., p. 203. 1842.—*Abercrombie*, Diseases of Brain, 3d edit., p. 369. 1846.—*Gendrin*, Anat. Path.—*Walshe*, The Nature and Treatment of Cancer, p. 526.—*Sanson*, Arch. Gen. de Med., t. iv., p. 691.—*Astley Cooper*, Surgery.—*B. F. Brodie*, On the Joints.—*Meckel*, Doane's ed., p. 507.—*C. A. Lee*, N. Y. Journ. Med. and Coll. Sci. Sept., 1849.

Am. Bibliog. and Refer.—*J. B. S. Jackson*, Cases of acute Affection of the Spinal Marrow, with Dissections, Amer. Journ. Med. Sci. January, 1847.—*Austin Flint*, Observations on the pathological Relations of the Medulla Spinalis, Ibid. April, 1844 (No. 14, N. S.)—*Thomas Sewall*, Case of diseased Spine, Ibid., vol. ix., O. S.—*Isaac Parrish*, Remarks on Spinal Irritation, as connected with nervous Diseases, with Cases, Ibid., vol. x., O. S. 1832.—*R. J. Turnbull*, A Case of Spinal Irritation, Ibid., vol. xi., O. S. 1832.—*G. Dorrance*, in Ibid., vol. xvi., O. S., p. 381.—*D. L. Rogers*, in Ibid., O. S., vol. xvi., p. 91.—*Andrew Nichols*, Case of Spinal Irritation in himself: a very instructive case, Ibid., vol. xiv., O. S., p. 524; and in Bost. Med. Journ., vol. x., p. 139.—*John H. Griscom*, Remarks on the Treatment of Curvature of the Spine, with two Cases, Ibid., vol. iii., N. S., p. 116, 1842; and in N. Y. Journ. Med., On Spinal Irritation, vol. ii., p. 300.—*Isaac G. Porter*, On Neuralgia of the Spinal Nerves, with Cases, Ibid., vol. xxiii., N. S., p. 81. 1838.—*Samuel Webber*, Case of Myelitis, Ibid., vol. xvii., N. S., p. 543.—*Henry H. Smith*, On the anatomical and physiological Characters of the Spinal Column, Ibid., vol. xx., N. S., p. 322.—*Samuel Annan*, Observations on Spinal Irritation and Inflammation, Ibid., vol. xx., N. S., p. 85; and Western Lancet, vol. v., p. 334.—*J. K. Mitchell*, On Curvatures of the Spine, Am. Ed. of Bampfield on the Diseases of the Spine; and in N. Am. Med. and Surg. Journ. July, 1827.—*H. J. Bowditch*, in Am. Journ. Med. Sci., p. 354. Apr., 1854.—*A. A. Gould*, in Ibid. Apr., 1853.—*Eli Hurd*, Case of (complete) Division of the Spinal Marrow, in N. Y. Journ. Med. and Coll. Sci., vol. v., p. 165. (This is a most remarkable case of complete division of the spinal cord, with total paralysis, and a subsequent restoration of function, showing union of the cord, as in cases of divided single nerves.)—*J. B. Brown*, On Brass Rachets and Corslets in Spinal Curvature, Bost. Med. Journ., vol. xxviii., p. 119 and 239; vol. xviii., p. 138, 314, &c.—*A. Abbe*, Mechanical Treatment of Curvatures of the Spine, Ibid., vol. xxviii., p. 152. (A defence of mechanical apparatus in the treatment of spinal curvatures.)—*Robert Capen*, in Ibid., vol. xxviii., p. 217.—*J. L. Hodges*, in Ibid., vol. xxviii., p. 283.—*J. G. Norwood*, in Ibid., vol. xiv., p. 373. (From Transylvania Med. Journ.)—*C. Jewett*, in Ibid., vol. viii., p. 188.—*H. A. Burrows*, Ibid., vol. viii., p. 70.—*Thomas Sewall*, Ibid., vol. vi., p. 56.—*J. C. Bradbury*, Ibid., vol. vi., p. 238.—*R. J. Turnbull*, vol. vii., p. 341.—*Charles Hubbard*, Ibid., vol. iv., p. 208.—*William Fitch*, Ibid., vol. iii., p. 829.—*A. S. Doane*, Am. Ed. of Good's Study of Medicine.—*George B. Wood*, A Treatise on the Practice of Medicine. Phil., 1847.—*Thomas Stewardson*, Am. Ed. of Elliotson's Practice.—*R. Dunglison*, The Practice of Medicine. Phil., 1848.—*John Bell*, Lectures on the Theory and Practice of Physic (*J. Bell* and *W. Stokes*), 2 vols. Phil., 1848. (Dr. B. endorses the opinion of M. Valliex, that what is commonly called spinal irritation is *dorso-intercostal neuralgia*, and may be detected by making moderate pressure with the finger on each side of the spinal column, at the spino-costal junction, and in the direction of the intervertebral foramina.)—*Samuel Henry Dickson*, Essays on Pathology and Therapeutics, 2 vols. Charleston, 1845. (A most philosophical and able work.)—*Wm. E. Horner*, A Treatise on pathological Anatomy. Phil., 1829. (Irritations of Medulla Spinalis, p. 389.)—*S. D. Gross*, Elements of Patholog. Anatomy, p. 369.—*Elizabeth Blackwell*, M.D., The Laws of Life, with special Reference to the physical Education of Girls, 12mo. N. York, 1850.—*Charles Chester*, Cases of cerebro-spinal Meningitis, in New Orleans Med. and Surg. Journ., vol. iv., p. 314.—*L. A. Dugas*, Remarks on the Pathology and Treatment of Convulsions, Southern Med. and Surg. Journ., vol. i., p. 1.—*J. J. Robertson*, On Spinal Irritation, in Ibid., vol. i., p. 229.—*A. Brigham*, An Inquiry concerning the Diseases and Functions of the Brain, the Spinal Cord, and the Nerves, 12mo.—*J. Harrison*, An Essay towards a correct Theory of the Nervous System.—*E. North*, Practical Observations on the Convulsions of Infants, 8vo.—*D. Oliver*, First Lines of Physiology, 8vo.—*J. Revere*, Translation of Magendie's Physiology.—*A. Walker*, Pathology, and the Nervous System, Am. eds.]

SPLEEN—DISEASES OF THE.—Synon.—Σπλήν, Gr. *Splen; Lien*, Lat. *Rate*, Fr. *Milz*, Ger. *Milza*, Ital. *Milt*.

1. The *diseases of the spleen* have not attached to themselves that degree of importance to which their not infrequent severity, their prevalence in malarious localities, more especially in warm climates and in armies, and the danger often attending them, most undeniably entitle them. This may be partly owing to the uncertainty hitherto existing respecting the functions of this organ in health, and of the exact nature and pathological relations of the maladies to which it is subject. The superficial manner in which disorders of the spleen have hitherto been considered is an opprobrium, with which not English medical literature merely, but the medical literature of other countries also, is justly chargeable. When it is considered that our expeditions and armies during the last two hundred years, and in all latitudes, from Heligoland, Walcheren, &c., to Burma and China in the East, and the Monte Video in the West—that all our colonists and settlers, from Canada to Australia—that all our dependencies in both the Eastern and Western hemispheres—and that all races, both fair and dark, more especially the former, have suffered more or less, and have not infrequently been carried off by diseases of the spleen, the imperfect knowledge and scanty literature of these diseases are matters of no small surprise.

2. I. Intimate Structure of the Spleen.—Before proceeding to consider the diseases of the spleen, it will be advisable to offer some remarks upon the normal structure of this organ. From the time of Winslow to that of Andral, this viscus was said to be composed of the following constituents: 1st. A fibrous structure, forming its sub-peritoneal, proper, and investing capsule or membrane, and detaching from its internal surface a number of fibrous septa and filaments, which divide and subdivide so as to form a number of cells into which the blood is effused; 2d. Veins, which throughout their whole extent communicate with these cells by an infinite number of perforations in their sides; 3d. Arteries, the small branches of which ramify on the septa of the cells; 4th. Nerves and lymphatic vessels. Sir E. Home and Beclard appear to have agreed with the foregoing description, and to have viewed the spleen as strictly an erectile structure.

3. More recently the microscopical anatomists, especially of Germany, have upset this account; and Müller, Ecker, Güsburg, Gluge, Œsterlen, Hessling, Gerluch, Giesker, Arnold, Kölliker, and others, have furnished us with very different descriptions of the structure of this viscus. These, however, by no means agree; but, as Kölliker's description appears to be the most minute, and to enjoy the most credit—as it is, moreover, published in this country, and in a contemporary work, I shall endeavour to give a brief account of the results of his researches. These are, however, by no means clear, and cer-

tainly tend to throw but little light upon the diseases and lesions of the organ.

4. This author notices, 1st. The *serous* or *peritoneal membrane*, which accurately covers the outer surface of the spleen, with the exception of the *hilus*, constituting the gastro-splenic ligament, and conveying the vessels to and from the viscus; this covering is intimately connected with the subjacent fibrous and proper coat of the organ.

5. 2d. The *fibrous* or *proper coat* encloses the parenchyma of the spleen on every side, as a sac or envelope, with the exception of the hilus, where the two membranes diverge, and are separated by vessels, nerves, and areolar tissue. The inner surface of the coat "bounds the parenchyma of the organ, and, with the exception of very numerous solid processes, which come off from it, is limited by the *trabecular tissue*. At the hilus of the spleen it sinks into the interior of the organ in the shape of tubes (*vaginæ vasorum*), which sheath the entering and emerging vessels, and are continued on these throughout the whole parenchyma." The fibrous coat is composed of white fibrous tissue, mixed with elastic or yellow fibres; the former of these consists of bands which take a parallel course, but do not form distinct bundles; and the latter are united in a very dense and irregular network.

6. 3d. The *trabecular tissue* consists of "white, shining, flat, or cylindrical fibres, which arise in great numbers from the inner surface of the fibrous coat, and in smaller quantity from the exterior surface of the sheaths of the vessels. These are so connected with similar fibres in the interior of the spleen as to form a network which extends throughout the organ. Between the fibres of this net exist a great number of spaces, which are connected with each other, and are occupied by the red spleen substance (5th) and splenic corpuscles (4th); and which, although very irregular in respect to their form and size, have yet a considerable resemblance to each other." The trabecular tissue completely corresponds with the fibrous coat, since it consists of white and yellow fibres; and this Kölliker considers to be muscular; but if this be admitted, the fibrous tunic should be considered as muscular also; and both being viewed as muscular, the contractions of the spleen, so often remarked upon, may be accounted for. Malpighi and others had, previously to this writer, contended for muscular fibres in the partitions of the spleen; but Kölliker appears to have been the first to demonstrate them microscopically.

7. 4th. The *splenic vesicles*, or *Malpighian corpuscles*, are whitish spherical corpuscles imbedded in the red spleen pulp (5). They are frequently not seen in the bodies of men dead of disease, although normal structures, which are invariably present in the healthy subject. The size of these corpuscles varies from one tenth to one third of a line, on an average of one sixth. They are imbedded in the red spleen substance, and, with the exception of one point, where they are attached to external twigs, they are every where surrounded by this substance. Hessling and Kölliker believe that, in the healthy spleen, they constitute from one fifth to one sixth of the whole splenic mass. Each Malpighian corpuscle possesses a special membrane and contents, and therefore is not a solid corpuscle, but rather vesicle, this membrane appearing to be only a modified portion of the vascular sheaths (§ 5) with which it is continuous. The contents consist of a small quantity of a clear fluid, and a large quantity of morphous particles, which, according to J. Müller, very much resemble the corpuscles of the spleen-pulp, and have a general likeness to the blood discs, but are irregularly spherical, often resembling the chyle corpuscles. Kölliker maintains that the Malpighian bodies are closed corpuscles, and stand in no connexion with the lymphatics; that they constitute a kind of shut glandular vesicle, and that there is nothing to warrant their being regarded as glandular vesicles.

8. 5th. The *red spleen substance*, *pulp*, or *parenchyma of the spleen*, is a soft reddish mass, which fills up all the interstices between the larger partitions and the stronger vessels. Having made a section of the viscus, it is easily scraped off or squeezed out. It consists essentially of three constituents, viz., fine blood-vessels, parenchyma-cells, and small portions of fibres, to which may be added extravasated blood in various metamorphoses. The cells of the spleen pulp, or parenchyma cells, are similar to the Malpighian corpuscles, but of a darker colour, and of a more variable and smaller size. The blood effused in the spleen pulp and the blood-globules are almost constantly undergoing dissolution in the spleen and disappearing, according to the researches of Kölliker.

9. 6th. The *vessels of the spleen* enter the hilus of the spleen, and, on arriving at the viscus, both arterial and venous branches receive, as a covering or sheath, a process of the tunica propria of the spleen, which forms the *vaginæ vasorum*, already noticed (§ 5). The calibre of the splenic vein, according to Home, Giesker, and others, is, in proportion to that of the artery, as five or six to one; while the thickness of its coats is very inconsiderable, and it has no valves. The arteries, veins, and nerves are enclosed in sheaths of the tunica propria; and not only are the trunks of entering and emerging vessels thus covered, but their finer ramifications receive a similar clothing. The arterial branches ramify minutely in the Malpighian corpuscles and surrounding red pulpy substance, into which latter part especially all the fine pencil-shaped ramifications pass; and the commencements of the veins spring from these branches. These nervous commencements or capillaries are tolerably large, anastomose frequently with each other, and scarcely have a special coat as yet. They give the cellular appearance seen in inflation of the veins of the pulp, and which, injected, form structures resembling the corpora cavernosa of the penis. The lymphatics in man are rather less numerous than in the other glandular organs.

10. 7th. The *nerves* of the spleen, proceeding from the splenic plexus, accompany the splenic artery, and divide in such wise at the giving off of its branches, that each artery receives one, or very frequently two nerves which accompany it, and here and there anastomose with each other. The nerves may be traced on the arteries which go to the Malpighian corpuscles; and by the aid of the microscope they may be seen passing into the pulp, on the pencils of minute arteries.

11. II. The Physiological Pathology of the Spleen rests on a knowledge of its structure; and therefore I have endeavoured to give, as succinctly as possible, the results of the researches of Kölliker. Hewson has remarked, that when an organ receives more blood than it requires for its own nutrition, we may conclude,

therefore, that the blood undergoes a change from it, or a secretory process takes place, and this applies strictly to the spleen. This physiologist, and subsequently Tiedemann and Gmelin, believed that a particular lymph is generated in the spleen, which serves to form blood-globules. But Kölliker opposes this view, and contends that the interior of the spleen is quite poor in lymphatic vessels, and that the blood in the splenic veins is poor in blood-globules; and hence that it is impossible to believe in the formation of a special lymph in the organ, or a relation to the lymphatic system. He contends that no trace whatever of the formation of blood-globules can be detected, but that, at every step of his researches, indications of a dissolution or decomposition of the globules in the spleen were presented to him. He concludes, "*that the blood-globules undergo solution in the spleen, and that their colouring matter is employed in preparing the colouring matter of the bile.*"

[It is a somewhat remarkable fact that the spleen has, in numerous cases, been removed from animals, and without any perceptible effect on their health. The same has again and again occurred, by accident or design, in the human subject. Experiments on the lower animals have been performed by many physiologists, all which go to establish the fact that the spleen is not essential to the health of the economy. Of forty cases in which the spleen was removed from dogs in Paris a few years since, more than one half recovered in a short time, the remaining number perishing from abdominal inflammation. During convalescence, they ate and drank as usual, digested well, nor were any of the functions appreciably disordered. Dr. Crisp exhibited, at the physiological meeting of the Medical Society of London, November 4, 1853, a dog, the spleen of which was removed two years and a half previous. The animal was in good condition, and did not appear in any way to have suffered from the loss of the organ. The blood, which was exhibited under the microscope, presented no abnormal appearance.—(*Med. Times and Gaz.*, Nov. 19, 1853.)

Notwithstanding these facts, it is generally maintained by physiologists that the spleen is intended, in some way or other, to operate on the blood which passes through it. To ascertain what these changes are, M. Beclard has performed a series of analyses of venous blood, which lead to some very important conclusions. His experiments entirely disprove the opinion of M. Donné, that the spleen is the organ by which the blood-globules are formed; as he has found that the blood of the splenic vein (previous to its junction with the vena portæ and veins of the stomach) contains a quantity of globules inferior not merely to arterial, but even to the average of that contained in venous blood generally. On the other hand, the proportion of albumen is increased. The examination of the blood of the vena portæ shows a very large proportion of globules, and a corresponding diminution of the albumen, as is shown by the following table:

	Venous Blood from Jugular Vein.	Arterial Blood.	Blood of Splenic Vein.	Blood of Vena Portæ.
Water	778.9	750.6	746.3	702.3
Albumen	79.4	89.5	124.8	70.6
Globules and fibrin	141.72	159.9	128.9	227.1

M. Beclard has established the fact, that though the constitution of venous blood varies, that of the arterial blood is constant in every part of the arterial system.—(*Annals de Chemie et de Phys.* Dec., 1847.)]

12. The contractile power of the spleen was observed by many anatomists, and an explanation of this power has been furnished by Kölliker's discovery of muscular or contractile fibres in it, as shown above. Hence this viscus can dilate and contract itself by relaxation of its contractile or muscular fibres existing in its balks, coats, and vessel-sheaths; and hence it becomes turgescent, and by contraction of these it becomes small. During its turgescence, a stagnation, and possibly even an extravasation of blood, takes place in its capillaries and pulp, the globules thus more readily undergoing solution or destruction: this change takes place in the Malpighian corpuscles, and in the parenchyma cells.

13. This theory of the function of the spleen has received the support of Ecker and Beclard, and it serves to explain the diseased condition of the viscus, and the influence exerted by those conditions on the economy. That this organ is more or less affected in the course of fevers, periodic, continued, and exanthematous, is well known, and especially when these maladies assume an adynamic or malignant character. That it is also often disordered or diseased in scurvy, purpura, chlorosis, rheumatism, and in some other chronic maladies, has been remarked; and it is generally admitted that enlargements and other organic changes of the organ, if they be of considerable continuance, are attended by more or less marked anæmia and emaciation. The emaciation, anæmia, and other changes in the blood, as a superabundance of fibrin, &c., so frequently observed in the progress of periodic fevers, rheumatism, &c., may readily be referred to dissolution of the blood-globules in the spleen during the congestions and enlargements of it in the course of these maladies. J. P. Frank has remarked respecting the spleen that, "aliorum fere morborum imperio turget et subsidet," and, in these circumstances, the changes produced by it on the blood cannot fail of being more or less considerable.

14. III. Causes of Diseases of the Spleen. —Diseases of this viscus will occur at all ages. I have seen them in infants of only a few weeks old, and in very aged persons, as well as at every intermediate age. They are very frequently met with in warm, marshy countries previously to puberty, in both the white and dark races, but more especially in the children of Europeans born in those countries. The children of English or other European parents born in the East or West Indies seldom escape some affection or other of the spleen, if they continue to live in malarious districts during the periods of childhood, or until the period of puberty. The male sex is more liable to them than the female, probably owing to the former being more exposed to the causes of splenic disease, and to the greater temperance, and to the periodic discharges of the latter. Of all causes, the *endemic* are the most influential, especially malaria from any of its various sources, and the use of marshy, stagnant, or impure water, or water preserved in tanks, or containing decayed vegetable or animal matters, or both. (See *art.* Endemic Influence.) These causes, according to their concurrence with other causes, or to

the constitution of the individual, are productive of either inflammations, congestions, enlargements, or other organic changes of the spleen, generally as a complication or as a consequence of periodic fevers; but they may produce these affections independently of antecedent or attendant periodic fever. Besides these causes, others are not without influence, namely, living in low, humid, and close situations, and in wet, clayey localities, or in cold and damp cellars; debility and vital depression produced in any way; unwholesome or insufficient food; running, long walks, and fatigue; intemperance in food or drink; and whatever contaminates or alters the constitution of the blood and chyle.

15. There are certain circumstances connected with the circulation and the state of the blood which favour the production of splenic disease, although various local and constitutional causes aid in the result. Continued muscular efforts not merely increase the rapidity of the circulation, but also change, in some degree, the state of the blood itself, and alter more or less its normal distribution in the several organs and parts of the frame. During muscular exertion, the blood is thrown inward in larger quantity, and distends the visceral veins and large venous trunks, the spleen becoming in some measure a diverticulum to the venous circulation in these circumstances. Somewhat similar changes occur during the cold stage of agues, and in the period of invasion of other fevers, before reaction takes place; but, instead of the circulation being greatly accelerated, and *active* congestion of, or vascular determination to internal viscera being produced, as in the former circumstances, it is rendered slower than natural in the latter; *passive* congestion of the internal veins and viscera being occasioned by the partial suppression of the circulation in the extremities and on the surface. During the operation of any of the former category of causes, the active determination of blood to the organ may occasion the more acute forms of splenic disease, while during the action of either of the latter, engorgements, enlargements, and other chronic affections of the organ are more liable to result.

16. The state of the blood itself also very materially influences the nature and form of the resulting disease. As long as this fluid continues uncontaminated, or preserves its natural crasis, the splenic affection retains more or less of a sthenic character. But when the blood becomes contaminated, either by infectious emanations, or by septic or deleterious effluvia, more especially by such as proceed from the decomposition of animal matter, the spleen experiences the most serious changes, and these generally assume an asthenic or septic character, this organ being not merely congested or enlarged, but also remarkably softened, deprived of vital cohesion, and otherwise greatly altered. There is no part of the frame which sooner or more remarkably betrays, by these changes, the consequences of vital depression and contamination of the circulation, especially in warm and malarious climates and localities, than the spleen.

17. Among the most common causes of disease of the spleen, especially of an acute character, are long marches in malarial countries, running, fatigue; falls, injuries, or blows on the left hypochondrium; drinking cold fluids when the body is overheated and perspiring, unwholesome beverages, and irregularities in diet. Hence the greater frequency of affections of the spleen, and the very acute form which these affections often assume, in soldiers in active service in warm climates. Diseases of a chronic kind, and very often those which are acute, are, in these circumstances, among the most difficult and serious maladies which come under the care of the physician; and they are not the less so that they are seldom primary, and rarely occur in persons previously healthy, they being more frequently complications, or consecutive upon, or sequelæ of other maladies, especially of periodic fevers, of obstructions of the liver, of chlorosis and uterine obstructions, of diseases of the heart and vascular system, particularly the veins.

18. Anxieties of mind, depression of spirits from any cause, discouragements, disappointments, losses of friends or fortune, nostalgia, and whatever tends to lessen the tone of the mind, or to depress mental vigour and activity, exert considerable influence both in predisposing to, and in more immediately producing disorders of the spleen. Persons predisposed by these causes are the most liable to be attacked not only by diseases of the spleen, but even more frequently by those maladies of which these diseases are either complications or sequelæ, and are much more susceptible of the effects of those endemic causes which are so injurious in hot climates. It is not great heat merely which is productive of diseases of the spleen and their allied maladies, but chiefly sudden falls, or rapid alternations of temperature [or a high *dew-point*.*] At the termination of the

* [We believe that a high *dew-point* has much to do in the production of splenic diseases, as well as of fevers of malarious origin, so called, and probably cholera, epidemic dysentery, yellow fever, and, indeed, most malignant diseases which prevail in warm seasons and certain localities; and we may take this occasion to remark that we were the first in this country, so far as we know and believe, to call attention to this subject. In a communication to the late Dr. S. Forry, and published in his work on "the Climate of the United States" (1842, p. 111), I remarked, that "the state of the dew-point exerts far greater influence upon animal bodies, especially in the production of disease, than temperature itself. This arises chiefly from the circumstance that a high state of the dew-point interrupts, to a greater or less extent, the healthy function of the skin and lungs, two of the most important organs of the body. I maintain that perfect decarbonization of the blood cannot take place in the lungs with a high dew-point, and, consequently, that the vital fluid cannot receive a sufficient quantity of oxygen to fit it for those various offices which it is designed to perform in the animal economy. An atmosphere with a high dew-point, moreover, carries off the vitreous electricity, which is doubtless intended to subserve an important end as a vital stimulus. We find, accordingly, that highly malignant fevers do not prevail where the dew-point is below 60°. The same is true of malaria. If we seek for the cause of the excessive fatality of tropical diseases, we shall find it in a dew-point of 70° or 80°. This gives efficiency to the malarious poison by checking its elimination from the system, and it also checks evaporation from the surface of the body, so that the 53 ounces of fluid, impregnated with nitrogenous and other matters, given off from the skin every 24 hours, in a moderate dew-point, is retained or disposed of through some different channel, constituting a material derangement of the animal economy." "The dew-point in our climate is fortunately, as a general rule, several degrees below the temperature of the atmosphere. It is but rare, indeed, that they nearly or quite coincide; such weather is then called *close*, *sultry*, or *muggy*, and its depressing influence on the system is too well known to be described. The very colour of the skin, to say nothing of the languor of the mind and the debility of the muscular system, shows that the blood does not undergo the proper change in the lungs. The baleful *Sirocco* is nothing but an atmosphere, set in motion, having a high dew-point."

The same views, with additional remarks and illustrations, were embodied in an article on "Hygrometrical Observations," and published in the *Boston Medical and Surgical Jour.*, vol xxvi., No. 8, p. 69. I remarked that, "from the observations of Dr. John Davy, it appears

periodic rains, and when the nights become comparatively cool or cold after hot days, the air being loaded with malaria, and the circulation determined, from the surface and extremities, upon the internal viscera, the frequent congestion of the spleen, thereby produced, or otherwise caused, as by the frequent recurrence of the cold stage of an ague, occasions either inflammatory or sub-inflammatory affections, or structural changes of this viscus,—results which the impression of malaria on the nervous system, when aided by mental depression and vicissitudes of temperature, the more certainly and severely induces. In warm climates congestions or other diseases of the spleen seldom occur in females, either primarily or consecutively of periodic fevers, without being associated with disordered menstruation—without delayed menstruation or chlorosis in young females, or suppressed menstruation or leucorrhœa in females of maturer age.

IV. Painful Affection of the Spleen.—Synon.—*Splenalgia* (σπλην, spleen; and αλγεω, I am pained). *Dolor lateris, obstructio lienis*, Auct. Var. *Splenis dolor—Splenic pain, pain in the left side.*

Classif.—II. Class, III. Order (*Author in Preface*).

19. Definit.—*Pain in the left side, without febrile symptoms, occurring often suddenly, and frequently ceasing as suddenly, sometimes caused by running, and occasionally being symptomatic of hysteria or uterine disorder.*

20. *A. splenalgia* most commonly occurs in the circumstances just named, and in its slightest forms it is often complained of by boys or others upon sudden exertion, especially running up hill, or against the wind, or ascending heights; and it usually ceases soon after the causes. When it appears in hysterical females, or in connexion with uterine disorder, it is much more obstinate and liable to recur. With the severity of pain referred to the left hypochondrium, there is often either shortness of breath, or a painful stitch on breathing, or frequent sighing, and the pain may be mistaken for pleurodynia, or even for pleurisy; but the absence of febrile symptoms, the circumstances in which it occurs, and its sudden or quick subsidence with the cessation of the cause, sufficiently characterize the disorder, and distinguish it from inflammatory or structural disease of the viscus. When splenalgia is occasioned by running or other kinds of physical exertion, it may with justice be imputed to a rapid or sudden congestion of the spleen by a greater flow of blood into the organ than return of the fluid by the veins; the sudden distention or turgescence causing stretching and pains of the fibrous structure and peritoneal envelope of the organ. When the affection is connected with hysteria, or with uterine disorder, or with indigestion, it may be imputed either to sudden congestion, or to a morbid sensibility of the nerves supplying the viscus. It may be remarked, that the term splenalgia has been improperly implied to both inflammatory and organic lesions of the spleen—as a generic term for splenic diseases—by some modern as well as earlier writers; I have restricted it as above.

21. *B.* The *treatment* of splenalgia depends upon its causes. If induced by the nature or amount of exercise, repose will generally soon remove it. If it be neuralgic, or connected with hysteria or uterine disorder, the means advised for these affections respectively will be most appropriate. Whenever this viscus betrays a disposition to disorder, by an increased or morbid sensibility, then a restorative treatment, especially by chalybeate preparations or mineral waters, appears to be indicated. But it should not be overlooked that this affection, by persistence or recurrence, may pass into prolonged congestion or tumefaction, or into acute or sub-acute, or chronic inflammation, although this latter is not of very frequent occurrence. In these circumstances, the treatment hereafter to be noticed should be adopted (§ 62, *et seq.*).

V. Congestion or Simple Turgescence of the Spleen.

Classif.—*See Painful Affections of.*

22. *Turgescence* of the spleen is generally *characterized by more or less pain or tenderness, by a fulness or weight in the left hypochondrium, sometimes by shortness or rather shallowness of breathing, and by various sympathetic feelings, according to its association or complication with periodic fevers, or other ailments.*

23. Congestions of the spleen are most commonly met in connexion with agues, with obstructions to the portal circulation, and with the other diseases incidental to warm and malarious climates, especially in children and young persons, and the offspring of Europeans in these climates. In its slighter states, congestion of this viscus is often a primary affection, and it then less frequently comes under the observation of the physician. It is chiefly when it occurs as a complication of malarious diseases, or when a frequent recurrence, or a prolonged continuance of congestion, has been followed by inflammation, or by permanent enlargement, or by other organic lesions of the viscus, that this disorder, or rather its consequences, comes under medical treatment.

24. *A.* The *symptoms* of splenic congestion vary much with the extent of congestion, with the rapidity of its occurrence, with the causes which produced it, with the temperament in

that on removal from a temperate to a tropical climate, in other words, from a low to a high dew-point, the animal heat, or temperature of the body, is raised several degrees, which is doubtless owing to the fact that sensible transpiration carries off less heat from the surface than insensible evaporation. This predisposes to, and doubtless excites, fevers and other forms of disease; and hence the utility of adopting a vegetable diet and the cooling regimen on visiting such countries. In tropical climates the liver takes on a vicarious and increased action, in order to discharge from the system the extra amount of carbon, which chiefly escapes from the lungs in temperate latitudes, where the dew-point is comparatively low. Blacks are less subject to fevers and other diseases incident to hot climates, because their skin is considerably modified in texture, so as to enable it to perform a greater extent of function than that of the white. Its thick and dark *rete mucosum* enables it to exhale not only a larger quantity of water and carbonic acid from the blood, but it secretes a more unctuous fluid, which is believed to possess considerable influence in counteracting the effects of the sun's rays, and in carrying off the superabundant caloric, thus diminishing the heat of the body. In short, the negro skin is adapted to a high dew-point, removing from the blood the carbon and other matters which, in the white, are, to a greater extent, discharged through the lungs and the liver. By the process of acclimation, the skin of the white may, after a time, so far discharge this vicarious office, as to resist the influence of a high dew-point, and thus escape disease."

The writer has never denied, as stated by Dr. R. La Roche (*On Pneumonia, &c.*, Phil., 1854), the existence of *malaria* as a true cause of disease; he has only maintained that it owes its greater efficiency and activity to a high dew-point. Numerous observations are now being concentrated on this point, and a few years will determine whether the views above advanced, and still maintained, are founded in truth or not.]

which it occurs, and with the disorders of which it is a complication. If its accession be sudden or rapid, there is generally more or less pain in the splenic region; if slow, or if the affection be consequent upon ague, pain may not be much complained of. But there is generally a sense of weight or uneasiness, or fulness; and more or less pain or soreness is induced by pressure or percussion of this region, with occasionally manifest enlargement, but more commonly only an indistinct fulness of this part. There is generally no fever, unless the affection be connected with some febrile disease. When the congestion is greater or of longer continuance, the digestive, assimilating, and excreting functions are more or less disturbed. The fulness or enlargement in the left hypochondrium is greater, is often attended by tension, and the pain or tenderness produced by pressure is more felt. Various sympathetic pains are then often experienced; and the patient presents a more sickly, or a more sallow or lurid, or even a partially anæmied hue. Sometimes also, especially when the disorder has been of some continuance, emaciation takes place, and the tongue becomes loaded or flabby, or indented at the edges. The skin generally remains cool; the pulse is low or weak, and the conjunctiva pale. The breathing is superficial or short, and the stools are very dark, while the urine is pale and of natural quantity. Females are generally, during the continuance of congestion of the spleen, subject to amenorrhœa, or to difficult and scanty menstruation, or to leucorrhœa.

25. If congestion of the spleen continue long or recur frequently, one or other of the affections about to be noticed generally supervenes, especially in hot and malarious localities, or when the disorder is connected with periodic fevers, or with obstruction to the portal circulation. Prolonged congestion, as well as other chronic diseases of the spleen, commonly is attended by, even if it actually be not influential in producing, a poor or morbid condition of the blood and impaired nutrition. The dark and sallow hue; the pallid lips, tongue, and gums; the general emaciation contrasting often remarkably with the fulness in the splenic region, and the deficient capillary circulation on the surface, impart a striking appearance to persons subject to chronic congestions and structural diseases of the spleen. Whether the changes produced in the blood by the spleen be such as tend to the full elaboration of the blood-globules—to the formation of healthy blood—as was believed by many pathologists, and only recently denied, or whether the spleen reduces or dissolves the blood-globules, and prevents their excessive formation, as inferred by Kölliker and others, there can be no doubt that diseases of the spleen induce a poor state of the blood, and more or less emaciation. If the former doctrine be entertained, the inference must necessarily be that the splenic disease impedes the healthy or natural changes produced by the spleen on the blood. If the latter theory be adopted, it will as necessarily follow that either the diseased spleen does not cease to reduce or dissolve the red globules, or that some other organ or organs take up the office vicariously for the spleen, and that, moreover, this office is discharged to a much greater extent during diseases of the viscus than it is even in health.

26. *B.* The *treatment* of splenic congestion consists chiefly in the removal of, or from, the causes producing the complaint, and in the cure or prevention of the diseases, of which it is consecutive. These causes are chiefly endemic, and hence change of air and locality is essential to a permanent cure of the complaint. Tonics, chalybeates, and stomachic aperients are generally beneficial. These secretions and excretions should be sufficiently free; but the means used to fulfil this intention ought not to be of a depressing kind. Stomachic and chologogue aperients should be conjoined with tonics, as the compound decoction of aloes with the compound mixture of iron, &c., or the compound infusion of gentian, with the infusion of rhubarb, &c.; or quinine, or preparations of cinchona may be given in various states of combination, according to the peculiarities of individual cases. In most cases, and even during residence in localities productive of congested spleen, I have found a combination of the sulphates of iron and quina, and the aloes and myrrh pill most serviceable, the last being given in sufficient quantity to act satisfactorily on the bowels. The treatment hereafter to be recommended for chronic enlargements of the spleen may also be prescribed in more obstinate cases, or when the disease is complicated with ague or with biliary obstruction. In the former morbid association, the decoction of bark, with serpentaria, or with the nitro-muriatic acids; or the infusion of calumba or quassia with preparations of iron, and sponging the surface of the abdomen with the nitro-muriatic acid solution, and an occasional recourse to a warm bath, followed by frictions with the horse-hair or Indian glove, will generally be most beneficial, due attention being always paid to the states of the intestinal and urinary excretions.

VI. Inflammations of the Spleen.—Synon. —*Splenitis*, Auct. Var. *Lienis Inflammatio*, Sennert. *Lienitis*, Auct. *Causa Splenitis*, Young. *Empresma Splenitis*, Good. *Splenite, Inflammation de la Rate*, Fr. *Entzündung der Milz, Milzentzündung*, Germ. *Acute and Chronic Splenitis.*

Classif.—III. Class, I. Order (*Author in Preface*).

27. Defin.—*Pain, increased fulness, weight or oppression in the left hypochondrium and side of the abdomen, with febrile symptoms of a continued, remittent, or intermittent character, according as endemic causes and morbid associations may influence the economy.*

28. *Splenitis* is not a frequent disease, especially in an acute, and still more particularly in a sthenically acute form. Much more frequently a sub-inflammatory state, or a sub-acute, or a chronic form of inflammation exists, the last named being often long present before it comes under the notice of the physician, or not being discovered by him until its results have been fully produced, or until they have been disclosed by a post-mortem examination. The existence of acute splenitis has been even denied by some writers; but even independently of the nature of the symptoms during life, the changes found after death sufficiently indicate an acute form of splenitis.

29. The *causes of splenitis* are those generally which have been noticed as producing indiscriminately the several affections of the spleen (§ 14, *et seq.*); but there are some which most commonly induce the inflammatory diseases of the viscus. These are chiefly exposure to low ranges of temperature after hot and sultry days in a ma-

larious climate; the suppression of accustomed discharges, as the hæmorrhoids and the catamenia, in these circumstances, especially if the persons thus affected have lived richly, fully, or intemperately. Neglect also of turgescent or congested states of the organ may be followed by inflammatory action, those states being merely the initiatory stages of inflammation. Running, long marches, especially when followed by exposure to malaria, to the night air or dew, or by resting or sleeping on the ground; contusions, blows, or other injuries on the left hypochondrium, and previous functional disorder of the viscus, are frequent causes of the several grades of inflammation of this organ.

30. i. ACUTE SPLENITIS, *when primary* or *idiopathic*, is most frequently the consequence of severe injuries of the splenic region, or of the spleen itself, and of the extension of inflammatory action from an adjoining viscus, as the stomach, liver, or peritoneum, to the spleen; but it may follow any of the causes already named (§14, *et seq.*).—*A.* It usually is ushered in by chills or rigours, followed by febrile action, and this by perspiration. To these are generally added nausea, depression, a sense of tension and fulness extending from the epigastrium around the left hypochondrium, and sometimes vomiting. A feeling of weight, oppression, and of tension is soon followed by more or less acute pain, extending often to some distance around the splenic region, and sometimes to the left shoulder; this region being deeply sore, tender, and often somewhat tumid, elastic, and tense. There are generally more or less thirst and loss of appetite. The urine is at first clear and highly coloured, afterward depositing a sediment. The fever is commonly continued or remittent, with evening exacerbations. At this stage, and with the urinary deposits, or with the occurrence of a copious perspiration, or with looseness of the bowels, or with an uterine or hæmorrhoidal discharge, the symptoms may abate, and the disease subside or disappear; or the inflammation may pass into a chronic state, the symptoms having abated more or less, but the swelling continuing, or being even increased.

31. *B.* In the *most acute* cases, occurring in the most unfavourable circumstances, as in soldiers during long marches in malarious localities, the disease often becomes greatly aggravated when advanced as far as just described, the local symptoms, as well as the general disturbance, being much increased. The tongue is furred and dry; diarrhœa supervenes, with sinking of vital power, delirium, hiccough, general tumefaction of the abdomen; or, in other cases, vomiting of blood, black or bloody stools, sunk and lurid features, general agitation and distress, unconscious evacuations, &c., and death in the course of five, eight, ten, or twelve days.

32. *C.* On *examination after death*, the spleen is found increased in size. The peritoneal envelope and proper coat are of a deeper or browner red than usually seen, approaching in places to a black or deep green. They are so soft and friable as to break down easily under the pressure of the finger. The internal structure is still more softened. Some parts appear a little more dense. These present a grayish or a yellowish gray hue, and contain points of purulent infiltration, which had begun to form, death having occurred, probably from sinking of vital power and contamination of the blood, in conjunction with the local change, before suppuration could proceed. In these cases the disease may be viewed as having gone on to gangrenous softening, or to a state very nearly approaching to this.

33. *D.* In cases less *hyper-acute*, the disease sometimes goes on to *suppuration*, and is generally of longer duration than the preceding form; but this result of acute splenitis is not frequent, unless in the unfavourable circumstances above alluded to (§ 31). In these, the disease, having apparently reached its acme in the course of from seven to twelve days, remits somewhat. The febrile symptoms and the pain abate, or the latter changes its character. Chills or rigours occur, terminating in flushes of heat and profuse perspiration. The swelling in the splenic region either increases or becomes more determinate or circumscribed, and the tenderness on pressure continues. The pulse is quick and soft, the symptoms varying much according to the direction the abscess may take. Generally, as the abscess advances, symptoms of partial peritonitis supervene, in the direction in which the abscess proceeds. The peritoneal envelope becomes inflamed at the part where the abscess points, and if adhesions are formed between it and an adjoining viscus, it will break into that viscus; if they be not formed, it will break into the peritoneal cavity, and general peritonitis instantly follow, and soon terminate fatally. Thus, in the course of splenic abscess, the pain in the side may become more acute, and the swelling more prominent, owing to adhesions of the external aspect of the spleen to the abdominal parietes, and to an external pointing of the abscess, which may occur in any situation between the left ribs and ilium, or between the umbilicus and left lumbar region. If the adhesion forms between the spleen and stomach, the gastric symptoms become severe, and the abscess may break into the stomach. Cases have been observed in which splenic abscesses have thus opened into the colon, into the stomach, through the diaphragm into the pleural cavity, into the lungs, &c.

34. *E. Abscess of the spleen* is generally, but not necessarily, fatal. Some of the cases of recovery, said to have taken place, are not very conclusive; while in a very few instances recorded, the evidence of the existence of abscess and of recovery from it is more convincing. Acute splenitis may apparently terminate in suppuration, and the above signs of suppuration (§ 33) may be present, and even an obscure fluctuation may be detected, and still the existence of abscess of the viscus may be disputed, or these symptoms may be even ascribed to other lesions. From this state the patient may recover; and although we may correctly infer that absorption of the pus formed in the viscus has taken place, yet the proofs of this may not be fully conclusive, although the states of the urinary, the intestinal, and the cutaneous excretions seem to warrant the inference. When the matter is discharged externally, or even by the stomach or bowels, the patient subsequently recovering, then the fact is conclusive. Dr. NASSE, of Bonn, has recorded the history of a case of splenic abscess, in which the matter made its way from the spleen through the diaphragm into the lung, and was expectorated in great quantity, the patient afterward recovering. As abscess of the spleen is comparatively rare, such cases must necessarily be much

rarer; but there is no reason wherefore abscess in this organ should be less likely than abscess of the liver to be recovered from.

35. Rokitansky observes that, in a favourable case, the abscesses may be circumscribed by adhesive inflammation, and, being inclosed in a sac formed by obliterated parenchyma, which has been converted into fibrous tissue, may be borne for a long period; a partial absorption of the pus may take place, and the remainder, becoming inspissated, be reduced to a calcareous, greasy pulp, or even to a hard concretion. The more common case is, that the parietes of the abscess also put on inflammatory action and suppurate, in consequence of which the abscess generally enlarges very rapidly, with symptoms of violent reaction in the shape of acute hectic fever. If the inflammation extends to the sheath of the spleen, inflammation of the splenic and adjoining peritoneal surface ensues, but is not, however, apt to spread far. He adds, "that the abscess may be discharged into the abdominal cavity, and produce circumscribed peritonitis, which causes the formation of a sac, bounded by the external wall of the abdomen and the diaphragm, the fundus ventriculi, the colon and its mesentery, the entire spleen being thus occasionally destroyed by suppuration." Much more frequently, however, the discharge of the matter into the peritoneal cavity is rapidly followed by general peritonitis and death.

[Prof. Drake, in his able work on the "Principal Diseases of the Mississippi Valley" (1850), has recorded eleven cases of *suppuration* of the spleen as a sequel of intermittent fever, in six of which the discharge of pus was by the bowels; in three externally, in one by both modes, and in one no evacuation took place. None of the abscesses made their way into the stomach, peritoneal cavity, or lungs, nor was the discharge of pus followed by hectic. It is worth noting, too, that all the patients recovered, except one who fell a victim to imprudence in eating, and two who had sustained severe local injury. All the cases occurred north of the 35th degree of latitude.]

36. While we conclude that acute splenitis may *terminate*, 1st. In resolution or recovery; 2d. In chronic splenitis and various organic changes of the viscus; 3d. In gangrenous softening or destruction of the organ; 4th. In suppuration or abscess—it may be still farther inferred that splenic abscess may be recovered from, 1st, by absorption and diminution of the puriform matter; 2d, by pointing externally or into some viscus, by which it may be discharged from the frame; but that it much more frequently terminates fatally, by the vital and local changes it occasions, and the contamination of the circulating fluids it produces, or by the consecutive changes it causes in adjoining organs or parts, into which it may proceed or break, as the peritoneum, stomach, &c.

37. *F. Asthenic acute*, or *consecutive Splenitis.*—Acute splenitis is much more frequently a *consecutive* than a primary disease—*consecutive of*, or *complicated with*, adynamic fevers, but more especially, and more frequently and severely with the jungle, or remittent or continued fevers of warm or malarious climates. In these circumstances and associations, the severity or malignancy of the fever often masks the splenic complication. The affection of the spleen, if it may be called inflammatory, is of a most *asthenic* and disorganizing kind; it implicates all the tissues of the organ, but attacks chiefly its internal structures, and proceeds in a very few days, often in three or four, to produce not only great turgescence, but a complete softening, often amounting to a liquefaction of the viscus. This form of disease is a frequent complication of the periodic fevers—intermittent and remittent—and of the continued fevers of the swampy or jungle districts of the East, and of Africa; and is often also observed in the course of these fevers in the countries bounding the Mediterranean. The *symptoms* of this form of splenitis are not severe, although the changes are most rapid and disorganizing—results which are chiefly to be ascribed to the primary fever, of which the splenitis is a dangerous complication. The extremely lurid state of the countenance and general surface, the vital depression, the swelling and tenderness in the splenic region, the decubitus on the back or right side, are among the earliest and chief signs; those which follow, especially the dry, dark tongue, the vomiting, often with discharges of blood, hiccough, delirium, rapid and weak pulse, &c., being ascribable as much to the primary fever as to this complication, but truly to both. The rapidly disorganizing course of this form of splenitis is caused chiefly by the marked depression of vital power, and the condition of the circulating fluids, the spleen being one of the most early parts of the economy to experience the effects of vital depression and of vascular contamination, the existence of these states both aggravating and accelerating the unfavourable result.

38. ii. Chronic Splenitis is much more frequently observed than the acute.—*A.* It may occur *primarily* or *consecutively* of the *acute* or *sub-acute*; for, between the most acute and most chronic or mild, there may exist, as in other inflammatory diseases, every grade of severity or duration. Chronic splenitis frequently does not come before the physician until it has given rise to changes which, although no longer entitled to the appellation of splenitis, are generally the results of inflammatory action or irritation. In malarious countries, chronic splenitis is most commonly a complication of agues, or a consequence of intermittents and remittents. In these circumstances, the initiatory inflammatory action is often masked by the primary disease. When the chronic affection is consequent upon an acute attack, the passage of the latter into the former is often gradual or insensible.

39. Chronic splenitis, whether primary or consequent upon periodic fever, or dysentery, or hepatitis, &c., may, by muscular exertion, by prolonged or quick marches, by mental excitement, or by injury, or even by a too rough examination of the splenic region, be aggravated to such a pitch as to assume a truly acute or a sub-acute form. But in many complicated cases, in which the patient has died subsequently to attacks of these diseases, especially in miasmatous districts, chronic splenitis has not been detected, or has been merely suspected, until a post-mortem inspection has shown purulent formations in the substance of the viscus, cartilaginous or ossific deposits in its fibrous coat, false membranes, or adhesions between the peritoneal envelope and adjoining viscera, and other changes sufficiently indicative of inflammatory action, which, however, had either not been manifested during life,

or had been overlooked, especially when masked by the primary disease.

40. *B.* The *symptoms* of chronic splenitis are, however, in some cases more distinctly evinced. The pain, weight, and uneasiness in the left hypochondrium are more felt, especially after exertion, and in soldiers after marches. There is generally a remittent or intermittent form of fever, either connected with ague, especially its more irregular types, or simulating this complaint, the exacerbations being most remarkable in the evening or night; the skin being dry, and the pulse frequent, while the countenance is sallow, and the skin harsh. As the disease proceeds, the already existing swelling of the splenic region, or even of the whole abdomen, increases, or becomes more tense, while the extremities and other parts are more or less emaciated. There are always indigestion, disturbed dreams, and obtuse pain or uneasiness in the left side, which is increased when turning in bed or on pressure. In some cases, a dry cough supervenes, with frequent and superficial respiration, and in others palpitation; and in the more prolonged or neglected, or improperly treated cases, ascites is superadded. After an indefinite time, either recovery takes place slowly, owing to change of climate and regimen, or death occurs from sinking of the vital powers in connexion with changes in this viscus and adjoining parts, especially purulent collections and alteration of the circulating fluids.

41. As in acute, so in chronic splenitis, the variation in the severity and character of the symptoms is very great. The duration also of the latter form varies remarkably. In the course of it various complications not infrequently appear, chiefly owing to the altered state of the circulating fluid, in some cases, doubtless, produced by the absorption of matter from the spleen, or from the extension of functional or structural disease from this viscus to adjoining organs. In many cases, as the disease advances, debility and emaciation become extreme; and hectic fever, sometimes slight, in other instances severe, is generally present. Vomiting or diarrhœa often occurs, and is generally obstinate or attended by discharges of blood either upward or downward. Aching of the back and limbs, restlessness, anxiety, weight, soreness, oppression and tenderness in the splenic region, are severally more or less experienced.

42. When considerable enlargement of the viscus attends chronic splenitis, dry suffocative cough, dyspnœa, hiccough, palpitations, &c., are often complained of; and in some instances, if the inflammation have extended to the surface of the upper portion of the viscus, the peritoneal lining of the diaphragm becomes implicated, and lymph with adhesions is sometimes formed, these symptoms being much aggravated and occasionally accompanied with several of those which I have shown to characterize *diaphragmitis* (see *art.* Diaphragm, § 2, *et seq.*). In other instances, the disease superinduces effusion of fluid in the peritoneal cavity, an occurrence often observed when chronic splenitis follows, or is associated with obstruction to the portal circulation through the liver, or structural disease of this viscus. Less frequently the disease extends to the left kidney; and in this case nephritis supervenes, with more or less disturbance of the urinary functions, and aggravation of the febrile symptoms, generally terminating in delirium, coma, and death. In rare instances, phlebitis in some limb or organ takes place, and soon carries off the patient.

43. The variations in the severity, the symptoms, associations, as well as the *duration* of chronic splenitis, are very great. If the disease accompany ague, it may be so slight at first as to escape attention; but it generally becomes more severe and manifest with the recurrence of the aguish paroxysms. If neglected at first, it often becomes a painful, a prolonged, and even a formidable disease, generally continuing several months, and not infrequently lasting for some years, with periods of remission.

44. *C.* The *terminations*, or rather the results of sub-acute and chronic splenitis, are: 1st, resolution, which seldom occurs; 2d, aggravation of the inflammatory action to a sub-acute, or even an acute form; 3d, suppuration and abscess in the forms already noticed; 4th, softening, induration, ossific deposits, &c.; 5th, enlargement, with various associated changes. Although *gangrene* sometimes follows the hyper-acute, or the asthenically or complicated acute form of the disease, it very rarely or never follows the chronic, unless this latter have become suddenly or severely aggravated by exertion, as by long or quick marches in military service, or by external injuries. These consequences or terminations are also common to the acute form, for this rapidly passes into a sub-acute or chronic state, unless when it is complicated with malignant or adynamic fever, and terminates in fatal disorganization or gangrene.

45. Dr. Voight states, that *splenalgia* (synonymous, according to him, with inflammatory affections of the spleen) rarely goes on to suppuration in Bengal; but, when not fatal, it generally terminates in induration, if not cured in time. The febrile symptoms then disappear, and pain in the left hypochondrium is much diminished, but the tumour remains, and becomes hard and distinct. The health improves, and, with the exception of costiveness, a sensation of fulness and weight under the left false ribs, a dry cough, some dyspnœa, and occasionally a slight pain shooting to the scapula, the patient feels pretty well, and may live on for many years in that condition. He is, however, generally predisposed by it to fever, liver complaints, dysentery, dropsy, and cholera, and by some one or other of these he is at last carried off.

46. In its more severe states, especially when complicated, splenitis runs its course very rapidly, and it may terminate in death in three weeks or a month. Œdema of the feet and legs, ascites, dysentery, ecchymoses, severe affections of the stomach, singultus, are the general precursors of death in sub-acute cases, while diarrhœa and hectic close the scene in the more chronic form. Persons who have once had disease of the spleen are very liable to be attacked by it again.

47. *D.* In *children*, chronic splenitis is not an infrequent disease, even in this country, at least according to my experience, during the many years of my being physician to the Infirmary for the Diseases of Children; but it is much more frequent in warm climates, especially among the children of European parents. In them it generally commences with anorexia, restlessness or fretfulness, and often sleeplessness. They gradually lose all desire of play, and become indifferent to surrounding objects. These precursory symptoms may continue some days, or even as

long as a fortnight, when the colour of health is more or less lost, and degenerates into a pallid, sallow, or even a leaden hue, and the conjunctiva assumes a pale bluish tint. The skin, especially over the abdomen, is dry and hot, and a greater degree of debility is experienced than the severity or duration of the complaint appears to warrant. The pulse is frequent, especially in the evening, and a remittent or hectic form of fever is commonly present; general uneasiness, headache, slight difficulty of respiration, and occasionally palpitation, and pain in the left shoulder, are also complained of. There is a constant feeling of tenderness and of weight in the left hypochondrium, increased by pressure. When the patient lies on his back, and the fingers are pressed under the false ribs of the left side, a hard tumour is felt, the size being generally less than that usually termed enlarged spleen, or even that called congested spleen. The patient dislikes the erect posture, and lies chiefly on the left side, with the knees drawn up, and the trunk curved. The bowels are irregular, generally costive, the evacuations being very dark, greenish, or greenish black. The urine is usually pale and copious. After an indeterminate time, either recovery takes place, or more severe or more complicated disease, and more marked sinking of vital power supervene and terminate existence. In some cases, the emaciation becomes remarkable before dissolution, and in these, as well as in others, ascites has often existed for a considerable time previously to death.

48. iii. Diagnosis of Splenitis. — Inflammation of the spleen may be either overlooked or be mistaken for some other disorder, especially for peritonitis, pleurisy, nephritis, or even for tumours, enlargements, &c., of the kidney. — *a.* When the symptoms of splenitis are mild, and when the disease appears in the course of remittent, intermittent, or continued fever, then it is often difficult to ascertain the existence of the local affection, and it very frequently is overlooked or undetected, until it has advanced to serious organic change. In all periodic fevers, and more especially in persons who have experienced more than one attack of these fevers, and still more particularly in warm, humid, and malarial localities, a very careful examination should be instituted, in order to determine the existence of splenitis or other affections of this organ.

49. *b.* The diagnostic symptoms vary much with the nature of the affection, and with the part of the organ chiefly attacked. When the upper part is inflamed or engorged, it may then press upon the diaphragm, occasioning dyspnœa, oppression in that situation, and even pain, which may be mistaken for pleurodynia or pleurisy. If the diaphragm be pushed upward by the enlarged spleen, the absence of the respiratory murmur, and the dulness on percussion at the base of the left thoracic cavity may suggest the existence of pleuritic effusion. But the absence of aigophony and the extension of the dulness below the margins of the ribs, and the persistence of dulness on percussion in different positions of the body, will indicate the nature of the disease.

50. *c.* The character of the pulse and of the pain will generally distinguish splenitis from *peritonitis*; but when the peritonitis is limited to a portion of the peritoneum in the vicinity of the spleen, and the symptoms are not very acute, it is very difficult to distinguish it from splenitis. The peculiarities of the case, the causes of the complaint, &c., will often aid the diagnosis. In *nephritis*, the history and antecedents of the disease, the state of the urine, and the symptoms characterizing it, sufficiently distinguish it from affections of the spleen. The same remarks apply to *psoitis*, which can hardly be confounded with splenitis. There is a much greater probability of *tumours* of the omentum, especially when they appear near the situation of the spleen, being mistaken for chronic inflammation or enlargement of this organ.

51. *d.* Simple *turgescence*, or various grades of *congestion* and *enlargement of the spleen*, may occasion, owing to the stretching or distention of the peritoneal envelope and fibrous coat of the viscus, more or less pain, and may thus be viewed as inflammation of the viscus, and suggest a practice not always the most appropriate to the state of the case. The circumstances and history of the case, especially the state of the pulse and the presence of febrile symptoms, will generally evince the nature of the disease; but it should not be overlooked that the effect of the distention or swelling of the organ upon its envelopes may be such as will often pass into inflammation, if not arrested by judicious means. *Splenalgia* (§ 19), whether produced by sudden turgescence of the viscus or hysteria, or neuralgia, or uterine disorder, may be similarly misunderstood, if the causes and alliances of the disorder be not attentively considered.

52. *e.* The diagnosis of *suppuration* or abscess of the spleen is very often difficult, the indications of this change being generally obscure. The antecedent disorder, an irregular recurrence of chills or rigours, the continuance of the febrile symptoms, the softness of the pulse, and the occurrence of sweats of unusual abundance, on frequent occasions, are indications of suppuration, but not actual proofs of its existence. When, however, there is also swelling or tumour in the splenic region, with pain or throbbing, and marked disorder of the stomach, the probability of abscess is greater than when the foregoing symptoms are not attended by any increase of the size of the organ.

53. *f.* The *complications* of affections of the spleen may either render more difficult, or may facilitate the diagnosis of these affections. Antecedent periodic fevers often indicate the spleen as the organ affected, when other signs of splenic disorder are present; but much more frequently the complications mask this disorder, and render the diagnosis more difficult, especially affections of the stomach, enlargements of the liver, diseases of the heart, pleurisy and pleuritic effusions, peritonitis, partial or general, and dropsical effusions into the peritoneal cavity. When chronic obstructions of the liver, or congestions, or even inaction of this organ, are evinced, or when organic disease of the heart is present, changes in the spleen are very frequently also present, although they may not be manifested during life.

54. iv. The Prognosis of splenitis and other diseases of the spleen depend much upon their severity, their nature, their causes, and their complications. When the affection is simple congestion, and is consequent upon intermittent fevers, the result is much more likely to be favourable than when it appears under other circumstances, or is produced by, or occurs in the course of remittent fever of a low adynamic or

putro-adynamic character. When the symptoms indicating splenic disease are obscure, of long continuance, and not amenable to treatment, the risk is much greater than when they are more acute and more deserving of reliance. When the most acute states of splenitis occur, especially when it is detected in the course of adynamic or malignant, remittent or other fevers, the danger should be considered as great; but the degree of danger or the hopes of recovery should depend very much upon the constitutional symptoms, and the states of vital power and of the circulating fluids. The effects of treatment, also, when this is rational and appropriate, ought not to be left out of view.

55. Even when the disease is sub-acute or chronic, our opinion of the result ought to depend much upon the history of the case, upon its origin, upon the state of constitutional power, upon the morbid associations it presents, and upon the evidence of the existence or non-existence of suppuration, or of the extension of disease to the peritoneum or adjoining organs. The signs of suppuration are always unfavourable, although recovery occurs in a few cases where this change has undoubtedly taken place. All the complications of diseased spleen are dangerous, especially pleuritic or peritonitic inflammations, or effusions, organic disease of the heart, obstructions, enlargements, or other structural lesions of the liver, disease of the stomach or bowels, and scurvy. Vomiting of blood, or the presence of blood in the stools, has been supposed by some to be a favourable crisis of splenic inflammations or enlargements. This may be the case in a few instances, but not in others. The occurrence of the catamenia in abundance at the natural period, and of the hæmorrhoidal discharge, is much more favourable than hæmorrhagic discharges from the digestive canal.

56. The prognosis in all diseases of the spleen should be guided also by the severity of the local symptoms, in connexion with the constitutional powers of the patient — by the state of emaciation, by the presence or absence of anæmia, by the manner in which the digestive and depurating functions are performed, by the extent of swelling and tenderness in the region of the spleen, by the duration of the complaint, and by the persistence or the removal of the causes, occasional or endemic, from which the disorder arose. As long as the patient continues to remain in the locality concerned in producing splenic disease, either a cure will be rendered difficult or abortive, or the disease will return with the season and circumstances which had previously produced it, with equal or even greater severity, and will either become more complicated, or terminate most unfavourably.

57. The *children* of European parents, residing in warm and malarious climates, affected with chronic splenitis, or other affections of this viscus, seldom recover completely or permanently, unless change of climate or locality be obtained for them. An amendment often takes place during the healthy season; but the complaint generally returns with or after the rainy season, either with increased severity, or in some one of the several complicated forms in which affections of the spleen present themselves in those climates, death generally, although at some remote period, taking place, often preceded by dropsy or great disorder of the digestive canal.

58. v. Treatment of Splenitis.—*A.* The *treatment of acute splenitis* has been very rationally stated by Van Swieten and Sauvages; but at the end of the last century and the commencement of this, the indiscriminate and often improper use of calomel, and of calomel conjoined with opium, superseded a more appropriate practice, especially in India, and was more frequently prejudicial than beneficial. More recently, the means usually employed have been both more rational and more salutary, although more discrimination in the employment of remedies against this disease than is usually evinced is still required. Calomel, or calomel and opium, general and local bleeding, &c., are still too generally prescribed, although in some cases either or even all of these may be required. The treatment mainly depends upon the stage or progress of the disease, upon the degree of either sthenic or asthenic action evinced by the local and constitutional symptoms, upon the type or character of the primary or of the symptomatic fever, and upon the air in which the patient resides. These should be severally weighed in connexion with the age and constitution, and previous disorders of the patient.

59. *a.* If the attack be recent, acute, more or less sthenic, and the disease be primary, and the symptomatic fever continued, a general blood-letting may be prescribed, according to the strength and age of the patient; and this will be the more required if the disease have been occasioned by injuries or causes directly affecting the spleen. In these circumstances, also, calomel, or calomel and opium, followed by a brisk cathartic, will be of service. A second general blood-letting will seldom be required, but local depletions may be necessary. In this form of disease, active purging, and diaphoretics in the intervals, are generally useful. Subsequently, the tepid bath, frictions of the surface, and the application of a terebinthinate embrocation or liniment, as advised in several parts of this work (see Appendix, For. 311), or a blister over the splenic region, will be of advantage. After the acute symptoms are removed, the persistence of disease in a sub-acute, chronic, or mild form, or enlargement of the viscus, will require a repetition of these external means, and a recourse to stomachic and cholagogue purgatives, or to such other means advised for these states of the disease as the circumstances of the case will suggest.

60. *b.* If acute splenitis be consecutive of adynamic, remittent, or malignant, or typhoid fever; if it present asthenic characters, even when primary; if the attendant fever be periodic, the pulse quick, weak, or soft; if the vital power be very much depressed, although vascular action be excited or the stomach irritable; if the disease has been of some duration, and has arisen from malaria and its usual consequences; if it have been accompanied with diarrhœa, or by hæmorrhagic discharges; and if the patient still continue, or is likely to remain, under the influence of the air instrumental in causing the attack, bleeding and other lowering means should not be resorted to. A very opposite treatment is required in these circumstances, and should be prescribed promptly and with decision. In these, the sulphate of quinine, the sulphate of iron, camphor, &c., should be conjoined with aloes, a very small quantity of this last acting freely on the bowels when combined with sulphate of quinine.

In some cases, it may be necessary to apply some leeches to the left side, and to give a full dose of calomel and camphor at the commencement, and a stomachic purgative in a few hours afterward, especially if the evacuations betray biliary obstruction or disorder. But immediately, or soon after their action on the bowels, a dose of the following pills ought to be taken, and the embrocation applied over the splenic region, or over the epigastrium, by means of flannel or spongio-piline moistened with it, especially if the stomach be irritable; and this application should be renewed according to the state of the case, and the effects produced by it.

No. 339. ℞ Quinæ Sulphatis, ℈j.; Ferri Sulphatis, gr. xxv.; Camphoræ, ℈j.; Extr. Aloes purif. (vel Pil. Aloes cum Myrrhâ), ʒss. ad ℈ij.; Pulv. Capsici, gr. x.; Extracti Taraxaci, ʒj.; Olei Cajuputi (vel Juniperi), q. s. M. Contunde bene et divide Massam in Pilulas xxxvj. Capiat æger duas, bis terve in die.

No. 340. ℞ Linimenti Terebinthinæ, ʒij.; Linimenti Camphoræ comp., ʒjss.; Olei Olivæ, ʒss.; Olei Cajuputi, ʒj. M. Fiat embrocatio more dicto utenda.

61. The ingredients in these may be varied in quantity, according to the effects produced by them, or others may be added or substituted. If sthenic action or febrile symptoms still continue, the sulphate of iron may be omitted; and if the bowels be already sufficiently acted upon, or if diarrhœa be present, opium may be substituted for the aloes, especially if pain be severe; and the vinum or extractum opii may be added to the embrocation. The warm or tepid bath; diaphoretics, frictions of the surface, and a farinaceous or emollient diet, and gentle aperients, will materially aid these remedies, and remove the disease altogether, or reduce it to a sub-acute, or chronic, or mild state. In climates where the patients continue subjected more or less to malaria; in persons addicted to intemperance in eating and drinking, or to the abuse of stimulants or alcoholic liquors; in those who have been subject to periodic fever, or to hepatic or dysenteric affections, acute splenitis often degenerates into the milder forms, or into some one or other of the organic diseases about to be noticed.

62. *B.* If *the sub-acute or chronic form of splenitis* be primary, if it be not a sequela of the acute, or if it do not appear in the course of intermittent or remittent fever, the treatment should depend much upon the severity of the initiatory symptoms. If these be severe, and the pulse excited, local depletion and a brisk cathartic will be of service; and if calomel be prescribed at the onset, or suggested by the appearance of the evacuations, it ought to be conjoined with a cathartic extract. I have seen in these cases, as well as in the most acute, a full dose of spirits of turpentine, with an equal quantity of castor oil, taken on the surface of cold coffee, or of milk, or of some aromatic water, and followed by the above medicines (§ 58–61), soon arrest the disease, especially when prescribed at an early period. At the commencement of these forms of splenitis, as well as in the acute, the enlargement of the viscus is generally not great, even although the pain may be considerable; but, as the disease continues, and as the more acute symptoms subside, the swelling increases, and the propriety of having recourse to those medicines which support vital resistance, and arrest the progress of the malady, becomes more manifest.

63. When sub-acute or chronic splenitis follows the acute, or occurs in the progress of periodic fevers, then a decided recourse may be had to the sulphate of quinine, combined as above (§ 60), never omitting the sulphate of iron when febrile or inflammatory action is not present; or the infusion or tincture of calumba may be given with the ammonio-chloride of iron, or with the ammonio-citrate of iron, or with the citrate of iron and quinine. Previously to the introduction of quinine into practice, I had employed the decoction of cinchona with ammonia and camphor, and the compound tincture of cinchona, with advantage.

64. In *the consecutive states* of chronic splenitis, the administration of these medicines should not prevent an active recourse to purgatives or cathartics, but these should generally be conjoined with bitters, stomachics, or tonics; and the external means, especially the embrocations and liniments already noticed, should not be overlooked. As the disease becomes more decidedly chronic or indolent, the enlargement often increases, and if these means have been duly employed without a satisfactory result, then those about to be recommended for chronic congestion and enlargement of the organ (§ 100, *et seq.*) should be employed, especially the iodide of iron in the sirup of sarza, and the sulphate of quinine and aloes in doses which will act freely on the bowels.

65. *C.* When acute, or sub-acute, or chronic splenitis is followed by symptoms of *suppuration*, or when more precise indications of abscess of the viscus exist, then the indication already stated, viz., to support the vital powers and resistance, should be steadily adhered to, while the secretions and excretions ought to be promoted. Various means may be additionally employed, according to the direction which the abscess may take. The most hopeful terminations of this state of disease is to procure the external pointing of the matter, or the absorption of it. The former of these may be attempted by means of poultices, or the insertion of a seton or issue, while the powers of the constitution are supported by the means already advised, aided by change of air, and a suitable diet and regimen. The latter, or absorption of the matter, if the internal or constitutional means be not judicious and energetic, may be followed by phlebitis, or by consecutive suppuration or abscess in other parts; but to obtain absorption when and as we could wish, is rarely in our power. This end can be attained only by preserving and promoting the digestive and assimilating processes, by promoting the excreting functions, by preserving the bowels in a freely open state, by conjoining vegetable tonics with chalybeates, and by removing the patient to a dry and pure air.

66. *D.* The *complications* of both acute and chronic splenitis should receive due attention.—*a.* If the early stage of the acute or sub-acute disease be primary, and appear to extend to the peritoneal surface of the diaphragm, or pleura, or to the fundus of the stomach, or to adjoining parts of the peritoneum, or to the left kidney, the initiatory bleeding already advised is generally required, and should be in such quantity, or be followed by such an amount of local depletion, as the circumstances of the case will warrant; and calomel, or calomel and opium, in one or two full doses, may also be given. But these should be followed by a cathartic, and preferably by the terebinthinate draught prescribed above (§ 62), which may be repeated according as it may be

required, and by blisters or the terebinthinate embrocation. Vascular depletion is rarely beneficial in other states of complication, and is generally prejudicial when the splenic disease appears consecutively, or as a complication of other maladies, especially when it is associated with dysentery, adynamic or remittent fevers, with obstructions to the portal circulation, scurvy, or disease of the heart.

67. *b.* When the *stomach* is prominently affected, and indeed in the other associations of the disease, whether *gastric*, *intestinal*, or *hæmorrhagic*, the terebinthinate embrocations or liniments already prescribed will prove serviceable, if duly persisted in—if applied over the epigastrium, the splenic region, or abdomen, and renewed, as circumstances may suggest. If chronic *diarrhœa* be associated with chronic splenitis, ipecacuanha may be given in the form of pill with the sulphate of iron, quinine, and the extract of hops. If the splenic disease be complicated with *disease of the heart*, our chief reliance should be placed on the sulphate or other preparations of iron, conjoined with the medicines just mentioned, or with henbane, conium, opium, &c., according to the peculiarities of individual cases.

68. *c.* The association of chronic splenitis or its consequences with biliary obstruction, or *hepatic disease*, is very frequent in warm and malarious climates, and is especially obstinate, the splenic affection generally going on to chronic enlargement. In this frequent complication, a weak dilution of the nitro-muriatic acids should be administered both internally and externally—internally with light bitter infusions, as the calumba or cheireita, and the preparations of taraxacum; and externally in foot-baths, or as tepid lotions or epithems over the hypochondria and abdomen. The preparations of iron should not be given in this complication. If *jaundice* be superadded, or dropsical effusion into the peritoneal cavity, the super-tartrate of potash may be prescribed in large doses, sometimes with small or moderate doses of the potassio-tartrate of iron, and always with extract of taraxacum, in the form of an electuary with any suitable sirup or confection; or the acids already named may be given in the compound decoction of scoparium. Whenever the liver is implicated, the preparations of iron are generally prejudicial, the potassio-tartrate being the only one admissible, and only in small doses. If the associated diseases of the spleen and liver be characterized by enlargement, or if these diseases be very chronic and indolent, the iodide of potassium may be employed, if these acids have failed, and may be conjoined with the solution or sub-carbonate of potash, and the decoction of taraxacum, or the compound decoction of scoparium. In cases such as these, the bowels should be kept freely open, and the constitutional powers duly supported.

69. *d.* For all *hæmorrhages* from the stomach or bowels, in the course of chronic splenitis, the spirits of turpentine, given by the mouth, or even administered in enemata, will be found the most efficacious in arresting the hæmorrhage, when the arrest is indicated, as it is most frequently, in splenic affections, or when it proceeds beyond what may prove salutary, or when it occurs in delicate, exhausted, or anæmied persons. This medicine may be prescribed as in the following formula, the dose being increased or repeated according to the urgency of the attack.

No. 341. ℞ Olei Terebinthinæ, ℥jss.; tere cum Pulv. Rad. Glycyrrh., ʒjss.; dein adde, Mellis et Syrupi Rosæ Gallicæ, āā, ʒjss., et misce. Capiat æger ʒss. pro re nata.

70. When the consequences of splenitis, especially enlargement or chronic congestion of the spleen, are connected with *amenorrhœa*, or with uterine disorder, the compound iron mixture, conjoined with the compound decoction of aloes, is most serviceable.

71. In all forms and complications of chronic splenitis, change of air is extremely beneficial, and the benefit is farther promoted when this change is conjoined with a regulated diet and a proper recourse to chalybeate or sulphureous mineral springs, or to artificial waters.

72. *E. The treatment advised by writers* on inflammation of the spleen has been stated more empirically than with due reference to the forms and stages of the disease. The early and acute stage is said, by a recent writer, to require "general blood-letting as long as the inflammatory pain is considerable, provided the patient's strength will admit of it. A moderate degree of catharsis should be kept up. A plentiful application of leeches to the seat of pain, followed by vesication, will sometimes complete the cure; but the disease is apt to remain latent: it may subside apparently, and then reappear with a violence sooner or later fatal."—(*Cyclop. of Pract. Med.*, vol. iv., p. 58.) As I have contended above (§ 60), the most acute splenitis, if it present asthenic characters, will not, however prompt or energetic the depletion may be, admit of this treatment; and even the most sthenic form of the disease requires the more cautious recourse to depletion which I have recommended, especially when the disease proceeds from endemic causes. It should be recollected that the causes are generally of a depressing nature, and if these still continue in action, too free depletion renders the disease more serious, and its consequences more difficult to remove. The reappearance of the complaint with fatal violence, here said to occur contingently, is frequently owing to the neglect of the tonic remedies which I have advised after the acute symptoms are subdued, especially when splenitis is consequent on periodic fevers, or is otherwise complicated, or when the patient remains in a malarious locality. When, however, the disease is associated with peritonitis or with pleuritis, &c., vascular depletion, general or local, as I have recommended, should not be neglected, with due reference, however, to the peculiarities of the case.

73. Sauvages insisted on the propriety of having recourse to tonics and to chalybeate preparations, in connexion with aperients and sedatives, as soon as the more acute symptoms were subdued. Dr. Bree advised active catharsis, and conium and other sedatives, to remove irritation. He endeavoured to subdue inflammatory action by blood-letting, antimonials, and local depletions. Grottanelli, who lived in a country where diseases of the spleen are endemic, advised for simple acute splenitis, and for splenitis complicated with gastritis or peritonitis, or diaphragmitis, or nephritis, or psoitis, hepatitis, or peripneumonia, general blood-letting, to be repeated if the circumstances of the case required it, or local bleeding in the nearest situation to the part most affected. As the disease subsided to a chronic state, he recommended those remedies which act chiefly by promoting absorption, and by acting

on the kidneys, and which are both antiphlogistic and diluent, as nitre, super-tartrate of potash, antimonials, digitalis, &c. If the attack followed suppression of the catamenia or of hæmorrhoids, he prescribed the application of leeches upon the recurrence of painful or severe symptoms, and as soon as all signs of hypersthenia had disappeared, the gradual use of tonics to be followed by chalybeates, especially the ammoniate of iron.

74. Inflammations, as well as other diseases of the spleen, must be treated in great measure with reference to the endemic influences which are chiefly concerned in producing them. In the miasmal districts of Western Africa, and in many countries in the East, these diseases very frequently either are not benefited, or are aggravated by general and sometimes even by local blood-letting, especially in the dark races. In most acute cases, however, local depletions, when duly regulated, are of use. But in temperate countries, either the one or the other form of depletion, or even both, are more generally required. In those more unfavourable and depressing localities, where greater caution in the use of antiphlogistic means is requisite, and the more acute symptoms rapidly pass into asthenic engorgement and enlargement of the organ, what have recent writers advised! Before the introduction of quinine into practice, I had occasion to treat cases in these unfavourable circumstances, and I had recourse, early in the disease, to the decoction of cinchona with camphor, aided by purgatives, and epithems externally, as advised above (§ 60, *et seq.*). Subsequently, a much earlier and a much more decided use of quinine, in the course of splenitis, than hitherto advised, was recommended by Nelet, Cruveilhier, Bailly, Piorry, Dalmas, and others, especially when the disease proceeds from malaria, or is associated with periodic fever; and even in the early and acute stage, a much more cautious and sparing recourse to vascular depletions and other antiphlogistics, than previously advised, was found advantageous in these circumstances. In most cases, however, purgatives are most serviceable, especially when duly selected, and conjoined with quinine or cinchona, or with preparations of iron, as I have already pointed out (see § 59, *et seq.*).

[The *spleen* is probably more exempt from disease than any organ of the body. Dietetic excesses and abuses, which so often light up disease in the alimentary canal, liver, kidneys, heart, and brain, do not often disturb this organ. This is remarkably the case as regards alcoholic stimulants, which so often produce disease in these organs, and especially the liver. The spleen seems to be but slightly influenced by vicissitudes of weather, nor is it apt to be affected by sympathetic relation with other and diseased organs. In fact, there is no organ of the body placed more beyond the influence of external agents, unless it be the pancreas. This is satisfactorily accounted for from its anatomical structure and relations.

While it is rarely affected by the existence of the ordinary forms of inflammatory disease, yet there are three kinds of fever, viz., yellow, typhus, and autumnal or miasmatic, in which the spleen is very apt to be more or less morbidly affected. In yellow fever, nothing is more common, in autopsic examinations, than to find this organ enlarged and softened; and this is a very common occurrence also in the typhoid fever, though effusions of pus or lymph are rarely met with. The same pathological condition is less frequently met with in typhus fever. But it is a remarkable circumstance that yellow and typhus fevers do not, in cases of recovery, leave behind them as consequences either splenitis or enlargement of the organ, though these are so frequently the result of fevers of malarious origin.

It is in the highest degree probable that during the cold stage the spleen becomes greatly congested, from the retreat of the blood from external parts, and its accumulation in the portal circle. That this is a very influential cause, may be inferred from the fact that remittents, in which the cold stage is less violent and protracted than in intermittents, disorder the spleen much less than the latter. But, as the late Dr. Drake maintained, malaria has probably a specific tendency to act on the spleen, just as the remote cause of typhoid fever directs its influence on the glands of Peyer. This would seem to be proved by the great frequency of splenic disorders in autumnal fever, from the influence of sulphate of quinine in removing some of them, and from the great frequency of splenic disorders in malarious regions, even among those who are exempt from febrile attacks. Another fact bearing on this point is, that disorders of the spleen are almost incurable, as long as the individual continues to reside in the locality which generated them, but often spontaneously disappear in a more salubrious residence. To both of the above causes, then, we may safely refer the causation of splenic diseases in malarious regions; and we have never known a case of disordered spleen which was not a sequel of intermittent fever. If they are unusually protracted, such is almost always the result; the enlargement at first not being attended with any inflammatory symptoms, which, however, are apt to supervene the ensuing winter under the vicissitudes of weather, &c. The enlargement, which at first appears to consist simply in a stasis and accumulation of blood in the organ, afterward assumes a more organized appearance, and appears to be made up of the peculiar pulpy matter of the organ, with a greater or less development of fibrous structure, constituting true hypertrophy. In most, if not all, fatal cases of malignant intermittent, the spleen will be found much enlarged and softened, sometimes almost diffluent, while those who recover from severe attacks are very apt to be troubled with splenic enlargement, even where the paroxysms have been comparatively few in number. True splenitis may be seated in the capsule or parenchyma of the organ; may invest the organ with bands of lymph, or fill it with factitious tissue, thereby hardening it, or it may result in softening or in suppuration.

With regard to the characteristic symptoms of splenitis, they are dull pain in the left hypochondrium, tenderness, on pressure, over the intercostal spaces, or below and behind the cartilages of the ribs, a sense of oppression in the neighbourhood of the diaphragm, frequently a hacking cough or hiccough, and sometimes pain in the left shoulder; if the organ is enlarged, there will be dulness on percussion, and the patient can lie on the opposite side better than in hepatitis. If the capsule be chiefly affected, there will be more pain and tenderness than if the parenchyma be the seat of the disease.

The treatment we have found most efficacious

is free local depletion by cups or leeches, followed by a large blister over the region of the spleen, and calomel in two-grain doses three times a day, followed by Rochelle salts or the compound powder of jalap, or compound colocynth mass and powdered squill, equal parts, with full doses of quinine as they may be indicated. Some of the preparations of iron are very efficacious after the inflammatory symptoms have subsided.]

75. VII. Organic Lesions of the Spleen.—*Structural Changes consequent on functional and inflammatory Diseases of the Viscus, and on periodic Fevers, or other Disorders.*

Classif.—IV. Class, I. Order (*Author*).

76. M. Andral considered that the structural alterations to which this organ is liable should be sought for in one of its two component parts—the part contained, which is blood, and the part containing, which is fibrous tissue. Those affecting the latter, or which are seated in the capsule or its fibrous prolongations, the trabecular tissue and muscular fibres of Kölliker, and in the pulp or parenchyma of the viscus, and in the splenic cells, he thinks, are of comparatively rare occurrence; those of the former, or which are found in the matter contained in those cells, are more important, inasmuch as they are variously modified, and, he conceives, intimately connected with the origin and nature of a number of morbid productions. The matter contained in the cells consists of blood and fibrin or lymph. This latter substance was first observed by Hewson, and has been recently viewed by Kölliker, as the fibrinous remains of the blood-globules after dissolution in the intimate structure of the spleen. The importance of this substance in the animal economy was insisted on by Tiedemann and Gmelin. M. Andral has made no reference to the observations of these physiologists; but, to the morbid states of this coagulated matter contained in the spleen, he has chiefly ascribed, not only a number of the changes which this organ exhibits, but many also which are found in the other parts of the body. Professors Tiedemann and Gmelin had attributed important offices to this matter, conceiving that it was influential, when carried into the chyle by the absorbents, or into the circulation, in changing the chyle into blood; and they had recourse to pathological facts in support of this opinion. But M. Andral went still farther, and conceived that "it enjoys, although not possessed of any distinct organization, perhaps, a greater sum of vitality than the fibrous tissue which contains it, and consequently is more prone to become altered in its nutrition, and to separate from its own substance various morbid products."

77. M. Andral has erred in imputing to this matter endowments and powers which it is not entitled to, and which are merely changes or modifications of this matter, owing to the states of the vital energies of the frame, especially as manifested in this viscus through the medium of the nerves supplying its blood-vessels and proper tissue—this matter itself not being the active agent in producing those changes, but the passive recipient merely of the influence exerted on it by the organic nerves supplying the organ, and undergoing changes in consequence of modified states of this influence. Besides, as I have shown above (§ 4, *et seq.*), the views of these pathologists have been disputed in the more recent researches of Kölliker, who has inferred, if he has not fully proved, that the spleen does not discharge the function which they have imputed to this organ, but, on the contrary, a very opposite one—that it produces a solution of the blood-globules, depriving them of their colouring matter, and preventing the excessive abundance of coloured globules in the blood which might otherwise occur.

78. i. The Causes of organic lesions of the spleen are, chiefly and more remotely, those already mentioned (§ 14, *et seq.*); but there are others which more immediately and directly induce these lesions, and which consist of previous disease—of one or other of the affections already mentioned, or even of a combination of them: 1st, of inflammatory action in some one of its grades, affecting chiefly the fibrous and muscular tissues of the organ; 2d, of remarkable impairment of vital power and of organic cohesion; 3d, of morbid states of the blood contained in, or circulating through, the viscus; and, 4th, of various combinations of the preceding conditions. During the influence of depressing causes, moral or physical, the spleen often experiences a deficiency of vital contractile power; and it hence soon becomes turgescent, or inflamed if the causes commonly productive of inflammation are in operation, and very soon afterward engorged and enlarged, or otherwise structurally altered. When the incipient symptoms are inflammatory, this state soon passes into organic change; and it is generally impossible to ascertain during life when the former terminates and the latter begins; the one passing insensibly into the other. With these successive changes, the blood-globules become more and more altered or dissolved, and the fibrin in the blood, or the corpuscles constituting fibrin, more abundant. During the changes of the blood, caused either by agents acting primarily on this fluid, or by disorders of depurating organs, the spleen also early and manifestly undergoes important alterations, for, not only is it more or less congested or enlarged, but its vital cohesion is also remarkably impaired, as shown by its state after death from malignant or adynamic maladies. Many of its organic changes, especially those which are chronic, may be imputed to the frequent occurrence of congestion, or of acute, sub-acute, or chronic inflammatory action, or to the absorption of morbid matter, or to the accumulation of injurious elements, owing to impaired excretion.

79. ii. Alterations of the Fibrous Structure of the Spleen.—*A. Lesions of the Capsule of the Viscus.*—These consist, 1st. Of an unusual injection and congestion of its blood-vessels; 2d. Of softening, in various grades, which may even be so great as to occasion its rupture; 3d. Of its thickening, either with or without some degree of induration; 4th. Of its transformation into fibro-cartilaginous, cartilaginous, or even osseous substances. These changes are independent of, although very frequently connected with, similar alterations in the peritoneal envelope of the organ, and more especially with inflammatory changes, as effusions of lymph and serum, false membranes on the free surface, or thickening of the peritoneal covering, adhesions to adjoining organs or parts, &c.

80. *B. Alterations of the Trabecular or Fibro-muscular Tissues and Parietes of the Splenic Cells.*—These are but imperfectly known. This part of the fibrous structure of the organ has

been found, however, 1st, in a state of softening; 2d, in a state of enlargement, rendering the septa thicker and more apparent than natural; 3d, partially changed, in rare cases, into a cartilaginous or osseous substance. From this it will be perceived that the changes of the internal fibrous structure of the spleen are nearly the same as those of its capsule. In respect of injection of the vessels ramified to it, and other inflammatory appearances, it may be remarked that they cannot be so readily recognised in the internal as in the external fibrous structure of the viscus.

81. iii. Lesions of the Spleen seated in both its containing and contained Parts.—The alterations observed in the coagulated matter contained in the cells of the spleen evidently result from a change in the vital conditions of the organ, by which the internal arrangement of the particles composing this matter is modified. The only question here is, whether this modification takes place subsequently to the formation of this matter, or at the moment of its secretion. Most probably this modification results from the influence exerted by the nerves upon the vessels producing this matter, and is not the remote consequence of changes experienced by it subsequently.

82. *A. Altered consistence of the spleen* is a very frequent occurrence, and seems to depend upon, 1st, the state of its fibrous structure; and, 2d, upon changes in the consistence of the coagulated matter and blood contained in its cells and capillaries. M. Andral refers alterations in its consistence, as well as other lesions of this organ about to be considered, to the state of the blood which fills the splenic cells and capillaries. This is substituting the effect for the cause, although, doubtless, a dissolved state of the blood which the spleen contains will materially diminish its natural firmness. It is much more likely that changes of this kind, as well as the greater number of the lesions of this viscus, depend more upon the state of its organic nervous influence, and upon the vital cohesion of its fibrous structure, than upon the condition of the blood contained in its cells. It may be allowed that the coagulated matter and the blood contained in the spleen experience important changes; but these are surely not primary, but the effects of that influence to which I have now referred them. This view of the subject is supported by the physiological researches of Home, Tiedemann, Gmelin, Schmidt, Prout, and Béclard, and by the experiments of M. Defermon.

83. *a. Softening of the spleen* is a very frequent lesion, particularly in fevers. In this state the natural cohesion of the capsule and of the fibrous and muscular septa is diminished, and the coagulating matter and the blood contained in the cells, pulp, and capillaries of the viscus have lost their natural crasis, so that they are readily washed out, leaving the fibrous structure entire. In some cases, the blood and the coagulating matter formed in the spleen are quite fluid, and the internal structure of the viscus so weakened and injured, generally from its diminished cohesion and great distention, that an indistinct sense of fluctuation is given upon examining the viscus externally. The spleen, when softened, is seldom diminished in size; it is generally either enlarged, sometimes greatly, or it preserves its natural volume. Softening with enlargement of this viscus is one of the most frequent lesions occasioned by adynamic or malignant fevers.

84. *b. Increased firmness or induration* of the spleen seems to result from augmented cohesion of the fibrous structure of the spleen and blood-vessels, or from a modified state of the coagulating matter contained in the cells of the viscus. In many cases of this description, the blood seems particularly dense, and, together with the coagulated matter, gives to the spleen, when divided, the appearance of a slice of the liver. When the increased firmness of the organ amounts to *induration*, the change may be attributed partly to a cartilaginous degeneration of portions of the fibrous structure, to thickening or hypertrophy of this structure consequent upon protracted inflammatory irritation, and partly to the formation of an organized or partially organized lymph, or to a fibrinous deposit in the parenchyma of the viscus. Increased firmness or induration is frequently associated with alterations of size, especially *enlargement*. *Alteration of the size* of the spleen is chiefly referable to the same causes as changes in its consistence, viz., to the vital cohesion of its structures, and of the blood and coagulated matter contained in it, and to the action of its different vessels.

85. iv. Enlargements or Tumours of the Spleen may proceed, 1st, from the diminished cohesion and yielding state of the fibrous substance; 2d, from diminished action of the veins and lymphatics; 3d, from a greater quantity of blood being accumulated in the capillaries and cells than is carried out by the veins; and, 4th, from a greater quantity of the coagulated matter being formed in than is removed from this organ. It is evident that the effect in question seldom proceeds from one only of the above causes, but generally depends, more or less, upon two or even a greater number of them.

86. *A.* When the spleen is much enlarged, it often ascends in the left hypochondrium, thrusts the diaphragm upward, and, becoming more closely applied to the surface of the ribs, occasions as dull a sound on percussion as is heard in the right hypochondrium from the presence of the liver. Sometimes the enlarged spleen, pressing thus upward, does not project beneath the margins of the ribs. In this case its enlargement can only be determined by percussion and auscultation. But more commonly it descends below the margins of the left ribs, occasioning a tumour, varying in dimensions and form. This tumour occupies the left hypochondrium, and may be so large as to extend to the left flank, to the epigastrium, and to the umbilical region. In some cases I have seen it so much enlarged as to extend to the right side of the abdomen. It should, however, be recollected that the spleen may form a tumour below the ribs without being materially enlarged, owing to the diaphragm being pressed downward by an effusion of fluid into the pleural cavity. Instances of excessive enlargement of the spleen, with or without induration or increased firmness, have been recorded by authors. Columbus and Schenck record cases in which the viscus weighed twenty pounds, the fibrous envelope being nearly cartilaginous. Burrowes saw one which weighed twelve pounds, and J. P. Frank one that was sixteen pounds weight. The more chronic cases of enlargement are frequently attended by some degree of induration; while the more rapidly formed instances of enlargement, as frequently observed in the more pestilential or miasmal climates, are characterized by more or less softening or friability of the viscus.

87. *B. Chronic tumours or enlargements of the spleen*—vulgarly *ague-cakes*—are very different from the enlargements of the viscus which take place from *vascular congestion* (§ 22, *et seq.*), and which occur not infrequently in the course, or as a sequela of adynamic or exanthematic fevers, or other diseases. These tumours differ in character, and are owing partly to hyperæmia, partly to the deposition of the anomalous fibrous product already noticed in the parenchyma of the spleen. The consistence of the organ varies greatly. The tumour or enlargement is most probably at first soft, but becomes harder, according as the deposit is more coagulable, and as the more fluid parts are absorbed. The colour of the swollen or enlarged viscus is probably at first reddish, but becomes paler as the colouring matter is absorbed, and as increased vascularity yields, and gives place to the fibrous deposit.

[*Hypertrophy or enlargement of the spleen* may be caused by such mechanical obstacles as impede the return of venous blood to the heart, and by such conditions of the blood as give a tendency to hyperæmia. Accordingly, we frequently meet with it in cases of organic disease of the heart. It is likely to occur whenever there exists any serious impediment to the circulation through the vena cava, where there is constriction or impermeability of the vena portæ, and where there has been suppression of menstrual or hæmorrhoidal evacuations. In all blood-diseases, as typhus, typhoid, cholera, &c., the spleen is frequently not only enlarged, but also altered in structure. In intermittents, hypertrophy of the organ is doubtless owing to its repeated hyperæmic condition. Not unfrequently is it found enlarged in Bright's disease, so as to weigh from 16 to 20 ounces, and so hard and brittle that, as in intermittents, it may be easily cut into thin slices or broken into fragments; presenting, on section, a coarse granular structure, nodules of the size of pepper-corns being imbedded in its substance, of a bluish red or dark violet colour, becoming bright red on exposure to the air. Its form, too, is somewhat changed, its inner border being broader, and firmer than natural. The fibrous capsule is not firmer than usual, and there are no morbid adhesions to the peritoneum, although these conditions are frequently found in the enlargement following intermittents. It is probable, as has been suggested, that this condition arises from a deposition of albumen in the substance of the organ, it remaining in the Malpighian bodies after the absorption of the watery elements.

There are some pathological lesions of the thoracic and abdominal viscera, usually existing in connexion with enlarged spleen, which deserve notice. They are, infiltration of the inferior and posterior parts of the lungs, with dark-coloured blood, congestion of the capillaries of the inner wall of the right ventricle of the heart, and accumulations of dark grumous blood in its right cavity; distentions of the veins surrounding the Malpighian pyramids of the kidneys; sanguineous effusions into the peritoneal cavity, into the external cellular tissues, and, in a majority of cases, into the intestinal canal also, which may have been attended during life with bloody evacuations, tenesmus, &c.]

88. *C. Diminished volume* of the spleen sometimes occurs, but much less frequently than increase of its size. Occasionally it is very much diminished. M. Andral has seen it no larger than a walnut. In cases of this description, the consistence of its fibrous structure, and of the contents of its cells, may be either increased or diminished. With the causes of atrophy of the spleen, and of the particular circumstances connected with it, we are altogether unacquainted.

89. *D.* The *colour* of the spleen is occasionally considerably changed. In some cases it is of a bright red, deepening through all the shades to a blackish hue. When this occurs in spots only, the organ presents a speckled appearance. It sometimes also assumes, in certain portions, a whitish or yellowish tint; these portions either retaining the same consistence as the rest of the organ, or being harder or softer than it. It is difficult to say whether this change of colour depends more upon diminished vascularity of the fibrous structure of the part thus affected, or on change of the colour and consistence of the coagulated matter and blood contained in the parenchyma and cells of the viscus. M. Andral imputes it entirely to the latter cause, and thinks it does not result from the formation of any new production.

90. v. Morbid Formations.—1st. *Purulent matter* is sometimes found in the spleen, either in isolated drops disseminated through its parenchyma, or in abscesses of various dimensions. These latter may here, as in the liver, be separated from the surrounding parts by a false membrane or cyst, or may be in immediate contact with, or pass insensibly into, the sound parts. Abscesses devoid of any cyst sometimes acquire a large size, occupying the greater part of the internal structure of the viscus. In these cases, the surrounding parenchyma is generally soft, pulpy, and readily breaks down, notwithstanding the utmost care. In the parts most distant from the collected matter, the capsule and fibrous tissue generally remain unchanged; but when the capsule comes in contact with the purulent matter, it also loses its vital cohesion, and allows the collected matter to find its way through it, either into the peritoneal cavity, or, having formed adhesions to adjoining viscera, into them. Abscesses of the spleen may thus burst into the stomach, the colon, the thorax, and even into the urinary passages. Cases have also been described wherein they have found their way, externally, through either the anterior abdominal parietes, or the back, or even the loins; but such occurrences are extremely rare.

91. Infiltration of purulent matter into the parenchyma of the spleen, as well as its collection in distinct abscesses, may coexist with similar depositions in other parenchymatous organs. Thus pus has been found in the spleen, liver, and lungs, and even in the brain also, of the same subject. It is sometimes found in one or more of these organs, and in the cavities of the joints in the same case. In all these cases the pus is formed in some other part, as in the veins, in the sinuses and cavity of the uterus, &c., whence it passes into the current of the circulation, and is either deposited in these situations, or occasions an inflammatory state of these parts, rapidly followed by the suppurating process. For reasons assigned in another place (see *arts.* Absorption, Abscess, *symptomatic*, and Veins, *diseases of*), I believe that the latter more commonly obtains. In some instances, as in phlebitis, metritis, &c., purulent matter is formed in the part primarily affected, and subsequently appears in the spleen

only; but more generally it is also found in some other situations at the same time. The majority of instances in which purulent matter is found in the spleen are of the above description. Those instances in which the pus has proceeded from inflammation, acute, sub-acute or chronic, originally affecting the substance of this viscus, are not common, unless as a complication of remittent and intermittent fevers; but in these cases of primary formation of matter in the spleen, according to my experience, a distinct abscess or abscesses are found, and rarely infiltration only, this latter being always a consecutive deposition or formation.

92. 2d. *Tubercular matter* is not infrequently found in the parenchyma of the spleen, generally in the form of minute grains, either isolated or clustered together. Tubercles of this organ are much more common in children than in adults; but they seldom are found in it, at any age, unless they exist in other organs at the same time. Tubercles are very common in the spleen of the lower animals.*

93. 3d. *Cysts*, of various kinds, are occasionally found in this organ. Their simplest form is that of small vesicles filled with a serous fluid, existing either singly or in clusters. These vesicles are sometimes found in great numbers. M. Andral states, that they are not confined to the splenic cells, he having found them within the splenic veins, some floating loose, others attached by peduncles to the sides of the veins, and others again lodged between their coats. He has also observed cysts of a much more complicated structure in the spleen: these consist of a serous or sero-fibrous tissue, containing either a honey-like matter, or a substance resembling suet, interspersed with hairs. *Hydatidic* cysts are sometimes found in the spleen, but not so frequently as in the liver. Their mode of development in the former is in every respect the same as in the latter. (See *art.* Liver, § 232.)

["The spleen," says Professor Gross, "is not unfrequently the seat of *calcareous concretions*; they are always isolated, usually not larger than a grain of mustard, of a rounded shape, and of a whitish or pale yellow colour. Their number varies from two to ten or fifteen. Bonetus mentions a case in which the organ appears to have been literally filled with them. The manner in which these bodies are formed is not well understood. My own opinion, founded upon careful and repeated examination, is, that they are developed in the branches of the splenic vein, from which, as they increase in size, they gradually escape into the parenchymatous substance. This view is countenanced by the fact that they are often seen in different stages of their formation, as the fibrous, the fibro-cartilaginous, cartilaginous, and osseous. The splenic tissue around these concretions is always unchanged. There is a variety of *osseous* concretion of the spleen, which occasionally acquires a very large bulk. Its mode of origin is unknown. It is of a pale, yellowish colour, rounded, oval, or more or less angular in its shape, and either solid, or partly solid and partly porous. In a case mentioned by Morgagni, a concretion of this kind weighed 21 drachms, and was arranged in concentric layers. Parallel examples are recorded by Valsalva, Baader, and Bartholin."—(*Elements of Path. Anat.*, 2d ed., p. 681.)]

94. As to *the origin* of the above formations much difference of opinion exists. M. Andral supposes that they are nothing else than the blood contained in the splenic cells modified in its qualities. "The experiments of M. Gendrin," he observes, "seem to prove that the blood may be converted into pus. The result of my own observations has convinced me that, by a simple alteration of its colour and consistence, it may be converted into a substance perfectly analogous to the encephaloid tissue described by Laennec. Let us go a little farther, and suppose the blood in small circumscribed masses deprived of its colour, and diminished in its consistence, so as to become curdy and friable, and we have then all the essential characters of tubercles."—(*Anat. Path.*)

95. The changes which M. Andral supposes to commence in the blood contained in the spleen should rather be referred to an alteration of the coagulated matter or lymph formed by the vessels ramified on the parietes of the splenic cells; both because the morbid deposit is more immediately produced by the vital action of this viscus and of its vessels, and is not a fluid circulating merely through it, and there arrested in its course; and because the morbid productions to which this author has referred, particularly tubercles and encephaloid tissue, have closer points of similarity to this particular coagulated matter than to the blood itself. Besides, we have no proofs that blood ever undergoes changes, similar to those for which M. Andral contends, from being contained in, or circulating through, the capillaries or cells of an erectile tissue. Whatever changes the splenic blood may undergo must result either from the state of organic nervous or vital influence, with which the spleen is endowed, or from the condition of the blood circulating in it, or from the properties of the coagulated matter which it is engaged in forming, supposing that this matter mixes with the blood taken up by the splenic veins. These causes may combine to produce the ultimate effect; but the first should be viewed as primarily and chiefly influential, and the latter as early results, inducing farther effects.

96. The *proximate causes* of the foregoing lesions of the spleen may depend, 1st, upon irritation in various grades up to acute inflammation; such as increased vascularity, induration, ossific change, primary formation of matter, &c.; 2d, on a diminution of the nervous and vital influence of the organ, affecting the action of its vessels and its functions, and the state of the blood contained in the capillaries of its proper structure and cells—as softening, changes of colour, congestion, enlargement, &c.; 3d, an obstructed return of blood through the veins, as from organic disease of the liver or of the heart, especially congestion, enlargement, induration, &c.; 4th, on a tendency existing in the system to the formation of the matters found in the spleen—as pus, tubercles, cancerous matter, cysts, &c. This tendency may depend on the local or general states of vital influence; or the substance found in the spleen may be conveyed through the channel of the circulation, and deposited or secreted in this situation. It is possible, also, that both these may coexist.

97. vi. Hæmorrhage in the Spleen.—*Apo-*

* [The spleen has occasionally been found affected with *melanosis* and *encephaloid*, also with a deposit of oil globules in its tissue; but these lesions are comparatively rare.]

plexy of the Spleen, Cruveilhier.—This able pathologist has described the hæmorrhages sometimes met with in the substance of the spleen, especially in the course of intermittent fevers. Hæmorrhagic deposits of various sizes, rounded in form, and exhibiting all the changes which the blood undergoes in apoplexy of the brain or other organs, are the appearances usually presented in cases of splenic apoplexy. Ochry-brown cicatrices and fibrous cysts of the same colour, observed in rarer instances, may be viewed as the remains of former hæmorrhages, with breach of substance. Hæmorrhagic effusion into the parenchyma of this viscus should not be confounded with pulpy softening of this viscus, from which it is altogether distinct. M. Cruveilhier remarks, that, at every strong muscular effort, the blood rushes into the structure of the spleen, distending it, and thereby causing rupture. What renders this opinion the more probable is the frequency of hæmorrhage in the spleen of the horse. M. Bailly has also adduced cases of spontaneous hæmorrhage into the substance of the spleen from ague.

98. vii. The Diagnosis of organic diseases of the spleen is extremely difficult as regards certain of them, and very easy as respects others. Enlargement and induration of this viscus are readily recognised, unless they be slight or incipient. The existence of *abscess* of the spleen is to be inferred from the history of the case and the symptoms mentioned above—especially when the acute disease has passed the sixteenth day, the viscus increasing in size—if fever be exasperated towards night, with increased heat in the soles of the feet and palms of the hands—if rigours appear, followed by flushes, perspirations, and a soft pulse—and if the complexion become more pallid, leaden, or sallow, and the bowels more relaxed. The existence of the other organic lesions of the spleen is often not manifested during life, and can very rarely be inferred with the least precision, either from the history of the case or from the symptoms complained of. Pulpy softening, however, when accompanied with more or less tumefaction, may be suspected from the softness and tenderness of the swelling and the antecedents of the case, but the examination ought always, in such instances, to be conducted with gentleness and care; for the spleen may be ruptured during life by a rough examination, especially in the advanced stage of remittent fever, during which this state of the spleen chiefly occurs.

99. viii. The Prognosis of structural changes of the spleen entirely depends upon the nature of these changes, many of which cannot be ascertained during life. The existence of *abscess* is always dangerous, but not always fatal, as recovery may take place in the manner already mentioned. *Enlargements* of the viscus are always serious maladies; but when they are not excessive, are not associated with obstructed liver or disease of the heart, are not accompanied with a boggy or pulpy feel upon examination, or extreme hardness, they may either be removed, or the patient may live some years without change in the tumour or in his general state. If the enlargement be pulpy or boggy, if it be attended by much tenderness or pain, or by extreme hardness, or accompanied with protracted diarrhœa, or with exhausting hæmorrhages from either the stomach or bowels, or with disease in the liver or other organs, or with abdominal dropsy, the prognosis should be very unfavourable. In all cases of inferred alteration of the spleen, the constitutional symptoms and the complications should guide the prognosis, especially the apparent amount of vital power, of vascular fulness, or of anæmia, and the connexion existing between it and diseases of other organs.

100. ix. The Treatment of structural diseases of the spleen has been in great measure stated when noticing the treatment of chronic splenitis. The chief and most common changes of this viscus, which come under the care of the physician, are *enlargement* and *induration*, and these are the usual consequences either of acute, sub-acute, or chronic splenitis, or of repeated attacks of congestion, caused by obstinate agues, especially in miasmal localities. After having recourse to purgatives, in the combinations already mentioned, more especially with sulphate of quina, sulphate of iron, &c. (§ 60, *et seq.*), and to liniments and embrocations applied over the splenic region, these morbid conditions generally disappear; but if they still continue, the *iodide of potassium* may be prescribed in connexion with such other means as the peculiarities of the case may suggest, as with the compound decoction of aloes, or the compound mixture of iron, or with both; or the iodide of iron may be taken in the sirup of sarza. In those cases, frictions of the surface of the body, especially over the hypochondria, with the liniments already mentioned, will prove very beneficial. During the treatment of these chronic and obstinate diseases of the spleen, due attention should be directed to the disorders which are so frequently associated with them, and more especially to obstructions or other affections of the liver, and disorders of the stomach and bowels.

101. In many cases of chronic enlargement or induration of the spleen, especially when associated, as either lesion very frequently is, with chronic disease or torpor of the liver, the *nitro-muriatic acid*, taken in the infusion of chereita or of calumba, with extract of taraxacum, and the external use of this acid, either as a bath to the extremities, or as lotion, wash, or epithem over the hypochondria, will prove most beneficial. If hæmatemesis or discharges of blood from the bowels occur, the state of the case should be duly weighed. If the patient have lived fully or richly, if he be young, plethoric, or robust, the hæmorrhage may prove more or less critical, and should not be prematurely arrested. In different circumstances, or when it proceeds too far as respects the condition of the patient, the arrest of it may be generally accomplished almost immediately by the spirits of turpentine, taken either in a full, or in small and frequently-repeated doses, as prescribed above (§ 62, 69).*

102. When amenorrhœa or chlorosis is connected with enlargement of the spleen, the combination of the compound steel mixture with the decoction of aloes, or the aloes and myrrh pill with the compound galbanum pill, may be prescribed and continued for some time, or the other medicines just now recommended may be taken, but due reference should always be had to

* [Prof. Gintrac recommends the sulphate of manganese in hypertrophy of the spleen, as a substitute for, and adjuvant of chalybeate remedies in splenic enlargements, attended with an anæmic state of the blood. He has related cases where 1½ gr. of this salt, given in the form of pill, twice daily, has effected permanent cures.]

the history of the case and its various morbid relations.

103. *Change of air* is the most important means of cure in all chronic affections of the spleen, and more especially when the patient resides in a low, humid, or miasmal locality, or in a hot and aguish or sultry district. Change to a more healthy climate, as far as this may be effected, or even a sea voyage, is essentially necessary to a complete or permanent recovery. When change of air can be associated with the use of *chalybeate* and *deobstruent mineral springs*, or artificial mineral waters of this kind, then the advantages of change will be very materially enhanced. Many of the chalybeate, saline chalybeate, and sulphureous waters of this country, of Scotland, Germany, &c., will prove very serviceable in completing a cure of splenic disease; but the particular spring which should be adopted ought to depend upon the peculiarities of particular cases.

104. The *diet* and *regimen* of the patient require strict attention, and should be duly regulated. If the patient live in, or have been removed to, a healthy air and locality, an abstemious or moderate and digestible diet, with temperance in the use of vinous or other beverages, will of itself, in due time, effect a cure; but this regimen should generally be only brought in aid of the treatment already advised, adapted with discrimination to the circumstances of each case. Care ought to be taken never to overload the stomach. Farinaceous articles of food should be taken in due proportion, and animal food only once in the day, in moderate quantity. Instead of the usual kinds of flesh meats, the more digestible kinds of fish—white fish—may be substituted twice or thrice in the week; but the fish ought never to be fried. Cocoa should be preferred to tea or coffee. Moderate exercise in the open air and in sunshine ought not to be neglected, more especially when splenic affections are accompanied with anæmia or chlorosis.

[Affections of the spleen are extremely common throughout our Western and Southern country, and in nearly all cases the sequelæ of intermittents. They are also most efficient causes in producing relapses in the same disease. The treatment is often wholly empirical, made up of antiphlogistic measures—emetics, cathartics, diuretics, quinine, iodine, chalybeates, counter-irritation, &c. It is generally agreed that the patient should be supported by nutritious diet throughout the whole course of treatment, and that the activity of the skin should be promoted by stimulating baths, frictions, flannel, &c. A change of locality to a non-malarious region is, in all cases, highly to be recommended. The remedies on which we place our chief reliance are cups and leeches, blue mass, blisters, sulphate of quinine, iodide of iron, aloes, colocynth, and taraxacum, alone or variously combined. The iodine paint, tincture, or liniment, applied freely over the splenic region, should in no case be neglected. In some cases, the iodide of mercury ointment may be advantageously substituted. With regard to the treatment of chronic splenitis, Prof. S. H. Dixon states, that "the mercurial treatment, formerly so much relied on, has fallen into comparative disuse, and that a majority of our physicians prefer to depend on the continued exhibition of drastic cathartics, as the combinations of aloes, with rhubarb, colocynth, &c.; and that some, borrowing from the practice of the Hindoos, who give vinegar and steel, while they purge the patient actively, have added tonics to their purgatives, and prescribe both iron and bark alternately with their cathartics. For my own part," says Dr. Dixon, "I cannot recommend any particular formulæ with great confidence in this obstinate malady. I think I have found most benefit from the use of iodine combined with mercury, as in the deutiodide of mercury and potassium, while the patient's bowels were kept soluble by the employment of blue pill with rhubarb, in such doses as were requisite, never pressing this matter very far. Cups or leeches over the tumour relieve pain. Fomentations applied to the side are useful. The diet of the patient should be light and nutritious. Tonics may be occasionally required, in which contingency I have been disposed to prefer iron, especially the new preparation known as the *Tinct. æth. acet. Ferri.* If the pain be constant and annoying, I do not hesitate to resort to anodynes and sedatives. Many have recommended conium and hyoscyamus, but the preparations of opium and the salts of morphine are the only articles of this class that deserve the least reliance."—(*Loc. cit.*)

For an admirable account of the various diseases of the spleen, common to our malarious districts, see Dr. Drake's work on the "Principal Diseases of the Valley of North America."

A very favourite prescription in St. Louis, and many parts of the Western States, for intermittents with enlarged spleen, is the following:

℞ Sulph. Quiniæ, ℈ij.; Aqu. Quiniæ, ℥ij.; Tr. Opii: Solutio Fowleri, ää, ʒij.; Sulph. Acid. Arom., ʒj. Dose, a tea-spoonful every two hours during the intermission. In severe cases, a solution twice the strength of the above is used with great success. The plan of treatment recommended by M. Voisin, of Limoges, has proved quite successful; viz., apply a mercurial plaster over the diseased organ, in which is incorporated six or eight scruples of the sulphate of quinine, to be renewed when exhausted, and worn for several weeks.]

Bibliog. and Refer.—*Hippocrates, περὶ παθῶν*, p. 241.—*Celsus*, l. iv., cap. 9. (*Recommends chalybeate water.*)—*Oribasius*, Synopsis, l. ix., c. 24.—*Avicenna*, Canon, l. iii., Fen. xv., tr. i., cap. 1, 4–9.—*Primerosius*, De Morbis Mulierum, l. iii., cap. 12.—*Columbus*, De Re Anatom., l. xv., p. 488. In *Haller*, Bibl. Med. Pract., t. ii., p. 125.—*Zacutus Lusitanus*, Pract. Admir., l. ii., obs. 42.—*Ballonius*, Opera, vol. i., p. 85. (*States the great prevalence of splenic disease in Autumn.*)—*Schenck*, L. iii., sec. ii., obs. 91, 92.—*Bianchi*, Historia Hepatis, &c., p. 112.—*F. Ulmus*, Libellus de Liene, 8vo. Lut. Paris, 1578.—*C. Drelincurtius*, Dissertatio de Lienosis, 4to. Lugd. Bat., 1693.—*L. Velthusius*, Tractatus de Liene et de Generatione, 12mo. Traj. ad Rhen., 1657.—*M. Malpighi*, De Liene, in Exercit. de Structura Viscerum, 12mo. Amst., 1669.—*M. Z. Pellin*, Ordo et Methodus cognoscendi Scirrhum Lienis, 4to. Jen., 1667.—*N. Grew*, Observations on a Diseased Spleen (Phil. Trans.), 4to. London, 1684.—*F. Lambert*, Explication des Accidens que la Rate cause dans le Corps Humain, &c., 12mo. Toul., 1684.—*F. Hoffmann*, Dissertatio de Morbis Lienosis (Opp. Suppl., ii.). Hal., 1704.—*W. Stukeley*, Of the Spleen, its Uses and Diseases, fol. Lond., 1723.—*J. V.* and *J. G. Scheid*, Observationes Lienum disruptorum (Hall, D. ad M.), 4to. Argent, 1725.—*C. F. Kaltschmid*, De Liene raræ magnitudinis (Hall., Diss. iv.). Jen., 1751.—*Morgagni*, De Sed. et Caus. Morb., Ep. xx., 52; Ep. xxxvi., 17, 23, 29.—*Schroeder*, De Splenis Usu, Morboque Splenico. 1761.—*Mayer*, Dissertatio Vomicæ Lienalis Historiam exponens (Doering, i.). Fr., 1781.—*Lieutaud*, Hist. Anatom. Med., l. i., obs. 796.—*Bang*, in Acta Reg. Soc. Med. Haun., t. ii., p. 65.—*Ruckstuhl*, Dissertatio de Morbis Lienis (Doering, i.). 1781.—*Chalmers*, On the Diseases of South Carolina, p. 21. (*Splenic diseases endemic there.*)—*Burrowes*, in Medical Facts and Observations, vol. vii., art. 18.—*De Haen*, Rat. Med., p. ix., cap. 2.—*Merck*, De Anatomia et Physiologia Lienis ejusque Abcessu. Giess., 1784.—*L.* and *J. P. Assolant*, Recherches sur la Rate, 8vo. Paris, 1800.—*M. Baillie*, Series of Engravings, &c., Fasc.

vi., pl. 1.—*A. M. Pleischl*, De Splenis Inflammatione, 8vo. Berlin, 1805.—*Portal*, Cours d'Anatomie Médicale, t. v., p. 335.—*K. W. Ammon*, Unterricht für Thierarzte über den Milzbrand, 8vo. Ausbach, 1808.—*Marcus*, Ephemeriden, b. iii., 1.—*Zeviani*, in Mem. della Societa de Verona, t. v.—*R. Bree*, On Pains of the Side from Diseased Spleen, in Med. Chir. Trans., vol. ii., p. 85; et vol. iii., p. 155.—*J. P. Frank*, De curandis Hominum Morbis, l. ii., p. 284; et l. v., par. ii., p. 377.—*C. H. Schmidt*, Commentatio de Pathologia Lienis, 4to. Goett., 1816.—*C. F. Heusinger*, Ueber den Bau und die Verrichtung der Milz, 8vo. Thionv., 1817.—*M. F. M. Audouard*, Des Congestions sanguines de la Rate, 8vo. Par., 1818.—*A. Contrelli*, Lettera sopra la Suppurazione della Milza, 8vo. Miss., 1819.—*Pinel*, Nosographie Philosophique, t. iii., p. 546.—*C. F. Heusinger*, Betrachtungen über den Entzündung der Milz, 8vo. Eisin., 1820.—*Ribes*, Dict. des Sc. Méd. (art. *Rate*), t. xlvii.—*F. Tiedemann* et *L. Gmelin*, Versuche über dio Wege, &c., 8vo. Heidelb., 1820.—*S. Grotanelli*, Animadversiones in acutæ et chronicæ Splenitidis Historiam, 8vo. Flor., 1821. *Rev.* in Lond. Med. Repos., vol. xvii.—*M. E. M. Bailly*, in Revue Méd., t. iv., p. 211. 1825. (*Rupture of the spleen.*)—*Schmidtmann*, Observat. Med., t. ii., p. 264–275.—*A. Moreschi*, Del vero e primario Uso della Milza, 8vo. Milan, 1823.—*W. Powel*, in Journ. de Progrès des Sciences Méd., t. xi., p. 157.—*Miller*, in Ibid., t. xi., p. 255.—*Strauz*, in Ibid., t. xvi.—*Andral*, Dict. de Méd. (art. *Splenite*), t. xix. Par., 1827.—*Schultz*, in Archives Génér. de Médecine, t. xx., p. 429; et *Strauz*, in Ibid., t. xvi., p. 122.—*Cruveilhier*, in Nouv. Biblioth. Méd., t. ix., p. 159. (*Pulpy softening.*)—*Bouillaud*, in Ibid., t. ix., p. 174. (*Hydatids in spleen.*)—*Ollivier*, Dict. de Méd. (art. *Rate*), t. xvii. Par., 1827.—*Hodgkin*, Trans. of Med. and Chirurg. Society, vol. xii., p. 68.—*J. O. Voight*, On Dis. of the Spleen as they occur in India, in Biblioth. for Læger., No. 2, 1334; and in Med. Gazette, vol. xviii., p. 268; and Brit. and For. Med. Rev., vol. i., p. 564.—*W. Twining*, Observations on Diseases of the Spleen, particularly on the Vascular Engorgement of that organ common in Bengal, in Trans. of the Med. and Phys. Soc. of Calcutta, vol. iii., p. 351. 1827.—*A. Campbell*, in Ibid., vol. viii., pt. 1st. 1836.—*P. A. Piorry*, Sur l'Engorgement de la Rate dans les Fièvres intermittentes, in Gaz. Méd. de Paris, p. 378. 1833.—*R. Bright*, in British and Foreign Med. Review, vol. vii., p. 468; On Diseases of Spleen, Ibid., vol. iii., p. 345; vol. viii., p. 248; Ibid., vol. xiii., p. 363; vol. xix., p. 31.—*Nepple*, Lettre sur l'Engorgement de la Rate dans les Fièvres intermittentes, in Gaz. Méd. de Paris, p. 613, 1833; Mémoire sur les Altérations de la Rate, in Journ. de Médecine de Lyon, Nos. 4 and 5, 1842; and Traité des Fièvres intermittentes, &c.—*M. Marcus*, De Functione Lienis, 8vo. Gryph., 1838.—*P. Pezerat*, Mém. sur l'Etat de la Rate dans les Fièvres périodiques, &c., in Arch. Gén. de Méd., 2me série, t. v., p. 199. 1834.—*Bigsby*, Cyc. of Pract. Med. (art. *Spleen*), vol. iv. 1834.—*A. Dalmas*, in Dict. de Méd. (art. *Rate*).—*C. F. Quittenbaum*, Comment. de Splenis Hypertrophia et Historia Extirpationis Splenis Hypertrophici cum Fortuna adversa in Fœmina viva factæ, 4to. Sig., 1836.—*Felici* et *Panizza*, in Med. Chirurg. Review, p. 531. April, 1837.—*V. Nivet*, Recherches sur l'Engorgement et l'Hypertrophie de la Rate, in Archives Gén. de Méd., 3me série, t. i., p. 310; and t. ii., p. 25. 1838.—*Andral*, in Med. Chirurg. Rev., p. 235. July, 1838.—*Raikem*, in Ibid., No. xxiii., p. 452.—*C. Rokitansky*, A Manual of Pathological Anatomy, vol. ii., transl. by *E. Sieveking* for the Sydenham Society, p. 167. London, 1849.—Descriptive Catalogue of Pathological Specimens contained in the Museum of the Royal College of Surgeons of England, vol. iii., *series* xxxii., p. 173. (*Cancer of Spleen*, 1484. *Tubercle of*, 1485–7.)—Descriptive Catalogue of the Anat. Museum of St. Bartholomew's Hospital, vol. i.; Pathological Anatomy, *series* xxii., p. 351.

[Am. Bibliog. and Refer.—*Daniel Drake*, Principal Diseases of the Interior Valley of North America. Cincinnati, 1850.—*S. H. Dixon*, Essays on Pathology and Ther. Charleston, 1845.—*Samuel Forry*, The Climate of the United States. New York, 1842.—*C. A. Lee*, in Ibid., p. 111–113.—*William B. Herrick*, Fatal Case of Rupture of the Spleen, Illinois Med. Journal, 1845; and Boston Med. and Surg. Jour., vol. xxxi., p. 78.—*N. Chapman*, Lectures on the more important Diseases of the Thoracic and Abdominal Viscera. Philadelphia, 1844. (Contains a lucid account of splenic diseases.)—*D. B. Slack*, On the Function of the Spleen, Boston Med. and Surg. Journal, vol. xxix., p. 59; and vol. xxviii., p. 498; and in New England Med. Jour., 1827.—*D. J. Macgowan*, An Account of *M. Piorry's* use of quinine for enlarged Spleen at La Pitié, where, in some cases, ʒj. was given in two doses, with the effect of reducing the spleen from 6 inches 6 lines in length to 5 inches 5 lines; ten days after, the size of the organ remaining the same, ʒj. quinine, given at one dose, reduced it to 3 inches 6 lines, which size it retained, and the patient was discharged cured 5 days after. Several instances are given where the spleen was reduced several inches in length in the course of 10 to 20 minutes, after giving from 40 to 60 grs. of quinine. Piorry contends that the "fever is not the cause, but the manifestation of the pathological condition of the spleen, and that, if the remedies are directed to this organ, so as to reduce it to its normal volume, there is no danger of a relapse, and that there can be no radical cure unless this be effected." (Boston Med. and Surg. Journal, vol. xxv., p. 393.)—*William Ingalls*, On the Structure, Functions, and Pathology of the Spleen, Ibid., vol. xxii., p. 149, 170, 185; and Fracture of, vol. i., p. 296.—Case of Excision of the Spleen in the human Subject, with subsequent enjoyment of good Health, Ibid., vol. xviii., p. 175.—*B. W. Dewey*, Case of enormous enlargement of Spleen, in Ibid., vol. xvi., p. 104.—*J. R. Brown*, Enlargement of Spleen, in Ibid., vol. xiv., p. 28.—*W. H. Webster*, Abs. of Spleen, Ibid., vol. xiv., p. 5.—*H. C. Gillette*, Enlargement of Spleen, Ibid., vol. x., p. 77.—*N. S. Davis*, Chronic enlargement of Spleen, Am. Jour. Med. Sci., vol. iv., N. S., p. 367.—*John Neill*, Case of Spontaneous Rupture of Spleen, Ibid., vol. iv., N. S., p. 369.—*A. G. Welch*, in Ibid., vol. v., N. S., p. 503.—*J. B. Potter*, Spontaneous Rupture of Spleen, in Western Lancet, Jan., 1845; and Am. Jour. Med. Sci., vol. ix., N. S., p. 523.—*J. B. Stuart*, in Am. Medical and Phil. Register, vol. xi., p. 131.—*J. W. Heustis*, On the Functions of the Liver and Spleen, in Am. Jour. Med. Sci., vol. iv., O. S., p. 73.—*William M. Lee*, Splenitis, in Ibid., vol. xii., O. S., p. 383. There are other essays and detached articles on the physiology and pathology of the spleen scattered throughout our other American journals and periodicals, which the editor does not deem it necessary to refer to more particularly. See also different works on the Am. Practice of Medicine.]

STAMMERING. *See art.* Voice and Speech, Disorders of.

STERILITY. *See* Impotence and Sterility; also, Pollution, Voluntary.

STOMACH, DISEASES OF—Comprising Cardia and Pylorus.—Synon.—Stomach, Γαστὴρ, στομαχος; *Ventriculus*, *Stomachus*; *Magen*, Germ. *Ventricule*, *Estomac*, Fr. *Stomacho*, Ital.

1. The stomach not only sympathizes most intimately with other organs, but also exercises over them a most powerful influence: it is not merely a passive sufferer of disorder on numerous occasions, but is, on many others, itself either actively diseased, or the most influential agent of the disorder of other organs. Hence, in many diseases, even of the most serious kind, the stomach is either chiefly affected, or most intimately sympathizes with the organ which is the seat of the disease. (See *art.* Sympathy.)

2. In most affections of the stomach, and in many diseases with which this organ sympathizes, there are certain prominent symptoms which may be, 1st, functional, or independent of any appreciable structural change of the organ or of any other part; 2d, or be caused by inflammatory, or by organic lesion of the viscus; 3d, or arise from disease of some allied organ or part, or even of the frame generally. These prominent and frequent symptoms are—*flatulence*, *acidity*, *heartburn*, *acrid eructations*, *water-brash or pyrosis*, *rumination*, *gastrodynia*, *nausea*, *and vomiting*, &c.; and as several of these may depend upon disorder of other viscera as well as of the stomach, the special consideration of them has been assigned to different heads, chiefly to Morbid Appetite, Flatulence, Indigestion, Digestive Canal, Gastro-enteric Disease, Pyrosis, Rumination, Vomiting, &c.; and to these articles I beg to refer the reader for various topics intimately connected with those involved in the present subject.

3. In our investigations of diseases of the stomach, the organization, the structural, the nervous, and the vascular connexions of the organ, the viscera bounding, and in close contact with it, and the varying states of its fulness and vacuity,

should severally receive attention, especially in connexion with habits and modes of living, with diet and regimen, with age and sex, and with artificial or injurious modes of dress. These severally, or more or less associated, modify not only the states, but also the position, not of the stomach merely, but also of surrounding viscera. *The functional disorders* of the stomach have been duly discussed under certain of the heads now enumerated, especially *flatulence* and *indigestion*; but before I proceed to consider the inflammatory and structural diseases of the organ, I shall offer a few remarks on the more painful affections usually referred to this organ, and which have generally been termed *gastrodynia* and *gastralgia*.

4. I. Painful Affections of the Stomach.—Synon.—*Gastrodynia* (from γαστὴρ, stomach; and ὀδύνη, pain). *Gastralgia* (from γαστὴρ, and ἄλγέω, I suffer pain). *Cardialgia*, καρδιαλγια, Sauvages, Darwin, Pinel, &c. *Spasmus ventriculi, Cardiaca passio*, Auct. *Limosis Cardialgia*, Good. *Morsus ventriculi, dolor ventriculi*, Auct. Var. *Doleur de l'estomac, Colique d'estomac*, Fr. *Magenschmerz, Magenkrampf, Magendrücken*, Germ. *Mal di stomaco*, Ital. *Pain in the stomach; cramp or spasms in the stomach; nervous affection of the stomach.*

Classif.—II. Class, III. Order (*Author in Preface*).

5. Definit.—*Severe, sometimes violent, pain in the region of the stomach, often of sudden occurrence, and, after an indefinite continuance, generally quickly ceasing; frequently eased by pressure, and unattended by tenderness or fever; commonly symptomatic, and very rarely primary, unless produced by injurious ingesta.*

6. The very painful seizures, commonly referred to the region of the stomach, and usually termed *gastrodynia*, or *gastralgia*, or *gastro-enteralgia*, are very generally viewed as affections of the nerves supplying this organ, such affections being often accompanied by more or less spasm of the muscular coats of the viscus. This view is probably correct, although the evidence in its support is by no means demonstrative; for the morbid sensibility constituting the seizure may have its origin either in the nerves distributed to the stomach, or in the ganglia or plexuses, whence these nerves proceed, or in those in the more immediate vicinity, as in the diaphragmatic nerves; or it may even be caused by the irritation and spasm produced by biliary calculi. The existence of spasm of the gastric muscular coats is often doubtful; in some cases the pain presents spasmodic features; in others it is not thus characterized. That the pain occasionally extends to both stomach and bowels, as inferred by some writers, the affection being in such cases called *gastro-enteralgia*, may be admitted; as it is difficult in all instances to dissociate the affection of the nerves of the stomach from a similar affection of the intestinal nerves, either co-existing or supervening the one on the other. This more extended affection will thus very nearly approach to the severer forms of colic or ileus, especially when the suffering in this latter affection is more or less referred to the epigastrium.

7. *Gastrodynia* occurs under a variety of circumstances: 1st, it may be altogether nervous or functional, and unconnected with any evidence of inflammatory or structural lesion; 2d, it may depend upon various grades or kinds of inflammatory action; 3d, it may proceed from any of the structural lesions about to be considered; and, 4th, it may be connected with gout, appearing in the form of atonic, misplaced, or metastatic gout, or even with rheumatism, although very rarely with this latter. It may, moreover, occur sympathetically of various other diseases, especially those which are seated in the abdominal viscera. The first of these manifestations of gastrodynia chiefly interests us at this place. In this state of the disease, as well as in the other, the secretions poured into the stomach are often much disordered, most frequently they are more or less acid. The acidity in these cases is either the cause of the pain, or the consequence, in the first instance, of the functional disorder, of which morbid sensibility constitutes a chief part, the pain being increased by the acid or morbid fluid and gaseous secretions produced during the impaired organic nervous or vital power of the stomach.*

8. This affection may occur in very different or even opposite states of the stomach. It may appear during inanition, or, at least, during an empty state of the viscus, or after repletion or an overloaded condition of the organ. It may be connected with anæmia, or with great vascular fulness. It may be referred to the nature or incongruity of the ingesta, or to flatulent distention; and it may be associated with any of the functional or structural affections of the stomach already noticed (§ 2, 7). In its severer forms, gas-

* The following remarks, pertinent to the subject, have been published by Dr. Bence Jones, who has most ably investigated this and many other topics in animal chemistry:

"In 1785, Carminati first observed the acid reaction of the digestive fluid. Werner, in 1800, confirmed the observation. Prout proved, in 1824, the presence of hydrochloric acid during digestion and in indigestion. Tiedemann and Gmelin found, in 1826, by irritation of the stomach, that acid was secreted, chiefly hydrochloric acid. They found also traces of acetic acid; and in the horse, they found also butyric acid. About 1830, Berzelius states that the acid reaction of the contents of the stomach is chiefly from hydrochloric acid, and the acids next in importance are the lactic and butyric. He concluded, from his own experiments, that lactic acid existed in all animal fluids, either free or combined In 1844, Liebig showed that this conclusion was not correct—that there was no lactic acid, even in milk, until it began to decompose; and this he showed to be true of other animal fluids. In 1845, I (Dr. Bence Jones) observed that when much acid is secreted by the stomach, the urine is found to be alkaline. The excess of acid in the stomach was hydrochloric acid; and the free alkali in the urine was fixed alkali, and not ammonia. In extreme cases, the alkalescence lasted for four hours. As the free acid was absorbed from the stomach the urine became acid, and this reaction increased until it was intensely acid to test paper. Thus, then, in health and disease, hydrochloric acid is liberated in the stomach. Acetic acid is sometimes present in small quantities, and perhaps lactic and butyric acids may occasionally be found. Phosphoric acid has not hitherto been proved to exist in the gastric fluid.

"The progress of animal chemistry leads to the expectation that many more organic acids will be found to be present in the stomach in disease. Starch and fat are two of the three great constituents of the food of man, and each gives origin to a long series of organic acids, the last of which, in either case, is carbonic acid, the product of respiration.

"The varying circumstances of disease render it probable that, in disorders of the digestive organs, many of the intermediate acids may be produced; that, although in the state of health the starch passes readily into carbonic acid and water, yet, in the state of disease, lactic acid, acetic acid, and formic acid may be produced. So, also, one or many of the fatty acids will most probably be found to result from indigestion. Thus butyric, caproic, and caprylic acids, closely related to each other in composition, are not unlikely to be present in the secretions of the stomach in disease"—(See Dr. Seymour, *on the Nature and Treatment of several severe Diseases*, &c., vol. i., p. 3.)

trodynia is sometimes associated with a morbid appetite or with gout, and in this latter state it often assumes the form of *cardialgia*—a form which many writers have described as a combination of gastrodynia with leipothymia, the distress being referred equally to the epigastrium and the præcordia. Gastrodynia, in its less violent forms, is often an attendant upon difficult or scanty menstruation, but it still more frequently assumes the form of gastro-enteralgia, or even of colic, in females who experience catamenial or uterine disorder. The more sudden and violent accessions of pains, with the shorter continuance and more rapid cessation of suffering, has been referred to cramp or spasm of the viscus; but, even admitting this condition to exist in these cases, a neuralgic state of the nerves of the viscus, or of those in the immediate vicinity, owing probably to some temporary irritant, may equally constitute the pathological condition; in either case the one morbid state will hardly exist, with much violence, without the other. Broussais and his followers would not admit the existence of either of these conditions independently of inflammatory action or structural change. This view of the complaint is sufficiently controverted in the article on Gastro-enteric Disease, and in what will appear in the sequel; the most severe states of gastrodynia often appearing under very different circumstances from those of inflammatory action or structural lesion.

9. i. The Causes of gastrodynia are remarkably numerous, and nevertheless it is sometimes difficult to assign the attack to any particular cause. The affection is frequently connected, more or less, with temperament and habit of body —with the nervous, irritable, or bilious; and is hence somewhat hereditary. It is much more frequent in the female than in the male sex, especially during uterine activity, and in the form of spasm or of cramp; in the nervous and susceptible; in persons of sedentary habits; in the insufficiently or unhealthily fed; and in those who are subjected to anxieties of mind and to the depressing emotions. Females are most liable to it about the period of the catamenia, and during gestation; also after large losses of blood, and prolonged leucorrhœa. It is often associated with anæmia or chlorosis. Gastrodynia, in its severer forms, is one of the most frequent consequences of masturbation in either sex; of a vegetable, poor, and indigestible food; of taking cold and acid beverages or fluids, especially during an overheated state of the system; or acid and unripe and stale fruits; of living in low, humid, and unwholesome localities; of intemperance in the use of spirituous or vinous liquors [and tobacco]; and of the more indigestible or incongruous articles of diet, or of excessive repletion, produced either by food or drink. The causes enumerated under the head of Appetite, Morbid; Flatulence; Indigestion, &c., are equally productive of the affection now being considered.

10. ii. The Symptoms of gastrodynia consist of the character, mode of accession and duration of the pain, and of the associated phenomena. The *pain* may be acute, pungent, lacerating, cutting, burning, or obtuse, dull or aching. It may be sudden, rapid, or slow in accession; and after continuing momentarily, or for a very short, or even an indefinite time, cease suddenly, quickly, or slowly. It may remit or intermit, or occur at irregular or indeterminate periods. It may occur at any period of the day or night, especially the former, and in every state of the stomach, more particularly when empty or overloaded. It may be attended by great distress and appearance of suffering; by constant restlessness, agitation, tossing, or even convulsive or spasmodic movements; by extreme anxiety, anguish, palpitations, tumultuous or irregular action of the heart, or by epigastric pulsations; by groaning, moaning, and irregular states of respiration, both diaphragmatic and voluntary; by choking in the throat, eructations of flatus, or partly of flatus and of acid, rancid or even alkaline matters, or the more forcible rejection of nidorous or variously disagreeable fluids. There are frequently borborygmi, flatulent distention at the epigastrium, and often in the other abdominal regions, sometimes with irregular spasmodic contractions, and efforts to vomit, the attempts being either abortive, or partially inefficient. The skin is often cool, especially the extremities, and the sufferings occasion a free or cold perspiration. Pressure of the gastric region generally affords a temporary ease. The countenance is anxious or partially sunk; the tongue is not materially changed from pre-existing states; the appetite may be morbid, ravenous, or lost, with or without nausea or retching. Thirst may or may not be experienced; and the bowels may be costive or irregular, and the stools more or less morbid. The urine may be pale and abundant, especially in females, when the gastrodynia is associated with uterine disorder. The pulse may not be materially affected, or it may be slow, intermittent, or irregular; or it may be small, quick, and irregular, while the action of the heart is hurried and tumultuous. Retchings or *vomitings* may or may not be present; but when the latter are observed, they are such as are described in that article.

11. iii. Diagnosis.—It is often difficult to determine whether the pain, attended by more or less of the above symptoms, be purely nervous, or the more prominent phenomenon, caused by spasm, or by inflammatory or organic disease of the stomach, or of a closely-adjoining part. The history, the concomitants, and the grouping of the symptoms of the case, will chiefly guide the physician. The causes of the attack ought to be carefully investigated before a positive opinion be formed or given. Attention to these: the absence of fever, of tenderness on pressure, or of tension, or of increased heat near the seat of pain; the state of the urine, and of the secretions generally; the free perspiration and coolness of the surface; the character of the pulse, and even of the pain in most instances; the existence of the nervous temperament, or of the hysterical or gouty diathesis; the *juventa* and *ladentia*, the effects of treatment, the habits, modes of life, the cravings, and the diet of the patient, will severally assist the diagnosis.

12. When the pain is caused chiefly by, or is connected with, *spasm* or *cramp of the stomach*, the morbid action, as Dr. Macfarlane has shown, in a very excellent paper on this subject, is communicated by the nerves to the muscles, inducing the most acute pain, with a feeling of rigid contraction, violent twisting or tearing in the epigastrium, soon followed by painful or interrupted breathing, difficult articulation, pallid countenance, small, hurried, and contracted pulse, and occasionally with coldness of the extremities, and rigid contraction of the recti abdominis and

gastrocnemii muscles. Pressure on the gastric regions in these cases, instead of increasing the pain, as in inflammatory and organic diseases of the stomach, generally affords more or less relief in this affection, which in some instances is followed by an attack of hiccough.

13. In all cases of gastrodynia, the nature of the ingesta, not only for a few hours previously to the attack, but also for several days, ought to be ascertained as accurately as possible; for the poisonous, injurious, or incongruous nature of these may have occasioned the attack; and, although inflammatory action may be the concomitant of the gastrodynia, this latter may be the chief lesion, the former being either asthenic, or of a kind which should be viewed as altogether subordinate. The nervous character of the complaint is sufficiently manifest in many cases; but in certain circumstances, especially when occurring in the gouty or rheumatic diathesis, or in the form of displaced gout, it is sometimes associated with congestion, or with asthenic inflammatory action; and much greater importance is frequently, in such cases, attached to these latter pathological conditions than to the state of the organic nervous power and vital resistance, which are too often allowed to sink, or which are even hastened to collapse by lowering or inappropriate means.

14. iv. The Prognosis of gastrodynia is generally favourable when the attack is not attended by tumultuous, or irregular, or intermittent action of the heart, or by leipothymia, or by a sense of fatal sinking, or a presentiment of approaching dissolution. These often accompany misplaced or metastatic gout, or the occurrence of severe gastrodynia in the gouty diathesis, or an attack in a person who is already the subject of organic disease of the heart, and should be viewed as extremely dangerous symptoms, although no indications of inflammation or structural change be present, or may be detected in the stomach or collatitious viscera after death. Several instances of this kind have come before me, one of them in a medical man. If the attack occurs in a person far advanced in life, or addicted to the abuse of spirituous or vinous potations, the existence of organic disease in this organ, or in its collatitious viscera, may be inferred, especially if singultus be present, and a prognosis may be formed accordingly. Nevertheless, the attack may not be the less nervous, this being the most important part of the disease as respects the existing suffering, and that to which immediate attention should be directed, as respects both the prognosis and the treatment. In the severer form of gastralgia, attended by the symptoms of cramp or spasm of the stomach, a cautious prognosis should be given. In a case, published by Dr. Macfarlane (*Glasgow Med. Journ.*, vol. ii., p. 182), of cramp of this viscus, the coats at one part were found completely torn asunder, so as to produce a large opening, no appearance of disease having been detected in the vicinity or in the margins of the aperture.

15. v. Treatment.—The *indications* of cure are: 1st, to allay the suffering of the patient; and, 2d, to prevent a return of the attack by ameliorating or removing the morbid conditions occasioning it.—*A.* The *first* of these is often best accomplished by ascertaining and expelling the cause of disorder, more especially when poisonous or injurious ingesta have produced it. In such cases the treatment should be directed as very fully stated, with reference to the individual *poisons*, at the places where these are considered; for the removal of these by an emetic, or by mechanical means, as there advised in respect of numerous injurious substances, or the neutralizing or counteracting their actions, is most essential to the obtaining of relief, whenever the attack can be traced to these causes. If the attack be attended by vomiting or by eructations, the state of the matters thrown off should receive attention; and if these furnish indications of acidity, the combination of antacids with emollients and anodynes are required. If the gastrodynia be characterized by cramp or spasms, rather than by acidity, antispasmodics and emollients should be given in frequent or large doses, with opium, camphor, ether, ammonia, &c. The following will generally afford relief:

No. 342. ℞ Magnesiæ Calcin., ʒij.; Tinct. Opii, ℥xxxvj.; Spirit. Carui, ʒij.; Aquæ Flor. Aurantii, Aquæ Pimentæ, āā, ʒiijss. Misce. Capiat æger cochl. iij. larga, omni horâ, vel bihorio.

No. 343. ℞ Mist. Amygdal. dulc., ʒvss.; Acidi Hydrocyanici diluti, ʒss.; Tinct. Opii, ʒss.; Spirit. Lavand. comp., ʒij. M. Fiat Mist., cujus sumantur cochl., iij. larga, secundis vel tertiis horis.

16. While these or other appropriate medicines, as may be found in the Appendix (see *Form.* No. 357), are being employed, either of the *embrocations* there prescribed (see *Form.* 311) may be applied by means of warm flannels or spongiopiline over the epigastrium. When the pain is attended by retching, it is sometimes beneficial to promote vomiting by copious draughts of warm emollient fluids, in order to dilute and promote the discharge of irritating ingesta, or of morbid secretions. After these have been duly evacuated, it is often requisite to allay both the irritability and the morbid sensibility of the organ by giving, along with each dose of either of the above medicines, one of the pills now prescribed.

No. 344. ℞ Creasoti, ℥ij.; Pulv. Cretæ comp., ʒij.; Syrupi Papaveris, q. s. M. Fiant Pilulæ xij. Capiat unam vel duas, pro dose.

17. When the gastrodynia is accompanied with much flatulence, or assumes a milder and more chronic form, or recurs frequently, the following may be taken, and repeated according to circumstances:

No. 345. ℞ Magnesiæ Calcinatæ (vel Sodæ Carbon.), gr. xij.-xvj.; Pulv. Rhei, gr. viij.; Pulv. Cascarillæ (vel Pulv. Columbæ), gr. v.; Pulv. Cinnamom. comp., gr. iij.; Aquæ puræ, ʒss. Misce. Fiat haustus.

No. 346. ℞ Bismuthi Nitratis, et Magnesiæ Carbonatis, āā, gr. x. ad xij.; tere cum Mucilag. Acaciæ ʒjss.; dein adde, Aquæ Flor. Aurantii, ʒij.; Spirit. Anisi, ʒj.; Tinct. Hyoscyami, ℥xxv.; Aquæ puræ, ʒx.; Syrupi Tolutani, ʒss. Misce. Fiat Haustus statim sumendus et horas post tres repetendus.

18. If the pain in the stomach be connected with biliary disorder, a full dose of calomel and opium may be given at first — from five to ten grains of calomel, and from one to two of opium; and afterward magnesia and rhubarb may be given in any aromatic water. If there be reason to infer that hydrochloric acid is present in the stomach, either vomiting should be provoked, or absorbents exhibited previously to the calomel; and if the retention of the latter by the stomach be doubted, a drop of creasote may be given in addition to opium or morphia. The gastrodynia caused by the retrocession or suppression of gout requires very decided means. I have seen several cases of this kind, and each one was somewhat different from the others in its features, and in the effects produced by treatment. In one

case (of a medical man), the attack was associated with enteralgia; in another, it was complicated with marked biliary disorder; in a third, it was attended by great disorder of the urinary organs. For the first, magnesia, camphor, opium, and capsicum were freely given in conjunction; for the second, magnesia, calomel, and opium; and for the third, the carbonate of soda, with camphor, carbonate of ammonia, and hydrocyanic acid. For all of them, terebinthinate embrocations were directed to the abdomen, and mustard cataplasms to the feet. The results were favourable in all. The treatment should vary with the peculiarities of each case; and these are so many, and often so different, according as the pain is associated with disorder of organs with which the stomach is connected by position or sympathy, that it is impossible to state all the means or combination of means which will be quite appropriate to all.

19. *B.* Having removed the present attack, it is requisite to ascertain, as fully as possible, the conditions of the several digestive and excreting functions, and to trace the influence which disorder of any of these may have in favouring a return of this affection. In most cases of gastrodynia, more or less indigestion or weakness of the digestive functions generally, or impaired action of the liver, and disorder of the excreting functions, are present, not merely for a short period, or contingently upon some manifest cause, but in a chronic or protracted form; and for these a well-devised course of treatment is necessary both to remove them and to prevent their recurrence. Biliary accumulations or obstructions should be removed by chologogue purgatives; weakness of the stomach, by bitter infusions, or other tonics; torpor of the liver, by mild mercurials, taraxacum, or the nitro-muriatic acids, according to circumstances; impaired excreting function, by diuretics, diaphoretics, aperients, emmenagogues, warm baths, &c. Acidity of the prima via ought to be prevented by antacids, as the fixed and volatile alkalies, magnesia, chalk, &c., conjoined with tonics or aperients, or even with both. Antispasmodics, carminatives, and anodynes may be added to these, according as indications for their use may appear, with a view of preventing, as well as of removing, an attack of gastrodynia, which may occur in females, especially about the period of the catamenia, or in nervous or irritable persons from errors in diet, although no very manifest disorder of any of the abdominal organs can be detected.

20. There is no disorder for which a duly regulated diet and regimen are more required than for gastrodynia. As to the *diet* which is found the best in this complaint, it is most difficult to determine. Articles of food which agree well in some cases, disagree in others. Pure cocoa, black tea in small quantity, farinaceous articles of diet, animal food in moderation, and chiefly mutton or game, and abstinence from saccharine substances, from pastry and from heating beverages, are generally deserving of adoption; but it is unnecessary to add to what is already advanced on this subject, and on *regimen* and the use of *mineral waters*, when treating of Indigestion (see § 55, *et seq.*), with which the complaint is so intimately allied, and of which it so frequently forms the most distressing part.

21. II. Inflammations of the Stomach.—Synon.—*Gastritis* (from γαστηρ, the stomach); *Ventriculi Inflammatio*, Boerhaave. *Febris Stomachica Inflammatoria*, Hoffmann. *Cardialgia Inflammatoria*, Tralles. *Gastritis*, Sauvages, Vogel, Cullen, Parr, Pinel, &c. *Cauma Gastritis*, Young. *Empresma Gastritis*, Good. *Gastrite, Inflammation de l'Estomac*, Fr. *Entzündung des Magens, Magenentzündung*, Germ. *Infiammazion des Stomaco*, Ital.

Classif.—1. *Class*, 2. *Order* (Cullen). 3. *Class*, 2. *Order* (Good). III. *Class*, I. Order (*Author in Preface*).

22. Defin.—*Anorexia, nausea, with pain in the region of the stomach, with or without chills or rigours; followed by febrile symptoms, by vomitings soon after the ingestion of substances, by a desire for cold fluids, by increased pain and tenderness on pressure, and, in the severer cases, attended by an internal sense of heat or burning, by extreme anxiety and dejection of mind, and by irrepressible vomitings or retchings.*

23. It is of some moment, upon entering on the consideration of inflammations of the stomach, to keep in recollection the organization and the connexions of the organ, and more especially the intimate structure of its villous coat, the nerves which supply it, which actuate its vital functions, and which form the bonds of sympathy between it and the brain, spinal cord, and associated viscera; and the relations, functional and structural, between the enveloping serous covering and surrounding viscera, on the one hand, and the internal surface of the other portions of the alimentary canal on the other; duly to consider the very intimate connexion subsisting between this viscus and the chief ganglial centre; the analogy, presented by the digestive canal and vessels proceeding from it, to the roots of plants; and the general type of conformation existing, in respect of this organ, throughout the whole animal creation.

24. Before proceeding to discuss the several forms or states in which gastritis occurs, I shall consider the causes of the disease, as they are chiefly concerned in producing or modifying these states, the morbid effects generally presenting a more or less manifest relation to the causes or concurrence of causes producing them.

25. i. Causes of Inflammations of the Stomach.—These are often the same as occasion inflammation of other organs; but there are many causes which most frequently and especially produce one or other of the forms of gastritis.

26. *A.* The *predisposing causes* of gastritis are more especially such as favour the occurrence of inflammation generally; as depression or exhaustion of organic nervous power, functional disorders of the digestive, assimilating, and excreting organs; alterations of the circulating fluids, especially imperfect depuration of the blood, and vascular plethora; high ranges of temperature, in connexion with a humid or malarious atmosphere; habitual excesses in food and spirituous or vinous liquors; sedentary employments, or occupations which are followed in a stooping position; mental application and the depressing emotions; the suppression of eruptions or accustomed discharges, of periodic losses of blood, or of external painful affections; convalescence from fevers or other acute maladies; sympathy with diseases of other organs or structures; and tight-lacing in females, or close cinctures, &c.

27. *B.* The *occasional exciting causes* are chiefly those which consist, 1st, of injurious ingesta; 2d, pre-existing disease; and, 3d, mechanical

agents or physical influences.—(*a*) Excesses in food or drink, beyond the usual quantity of either, or as regards the incongruous nature of the articles; irritating and indigestible food, especially dried, preserved, or long-kept animal substances; various kinds of fish, more particularly shell-fish, in certain idiosyncrasies; a too high or too low temperature of the articles taken into the stomach, especially when taken in large quantities and in predisposed states of the frame, unnatural distention and oppletion of the stomach; the excessive use of any stimulant, particularly alcoholic liquors, tinctures, cordials, &c., of aromatics, spices, rich sauces, highly-seasoned dishes, &c., or of vinous, saccharine, acid, or fermenting beverages; an inappropriate recourse to irritating emetics or purgatives, particularly in large doses, as when the former has been thus given in order to procure the expulsion of narcotic or other poisons; the ingestion of any of the numerous articles comprised in the classes of irritant, acid, and narcotico-irritant poisons (see *art.* Poisons); the use of various resinous, oleaginous, alkaline, or acid medicines in too large or frequent doses, or of various vegetable or other concentrated principles; spoiled, putrid, or rancid, or unwholesome kinds of food, or impure, stagnant, or contaminated water; rancid, fatty, or oleaginous articles; and unripe, acid, or stale vegetables or fruits.

28. (*b*) Pre-existing disorders or diseases may run on to some form or other of gastritis, either by their increased severity, or by their extension to one or more of the tissues of the stomach. Thus, flatulence and other forms of indigestion, pyrosis, morbid appetite, or rumination may pass into gastritis, either spontaneously, or more commonly after errors of diet or regimen, or after a recourse to injudicious remedial means, or to unwholesome or unsuitable food or drink. Biliary disorders, particularly accumulations of acrid bile in the gall-bladder or ducts, may occasion gastritis, the irruption of the bile into the duodenum, and partially into the stomach, irritating or inflaming both these viscera. Disease or severe injury of distant organs, with which the stomach is most disposed to sympathize, as the brain, kidneys, uterus, skin, &c., may not only predispose, but even excite this viscus to inflammatory action. More frequently, however, the stomach becomes implicated either by continuity of structure or by contiguity of position. Thus inflammation of the œsophagus may extend to the stomach, or both diseases may be coetaneously induced, as when vomiting has been procured by large quantities of mustard; and of this result I have seen two or three instances. The villous coat of the stomach and small intestines may be affected either more or less extensively, or in a limited extent at first, the inflammation extending afterward more or less in either direction, according to the predisposition and to the nature of the exciting cause. The stomach not infrequently, also, becomes implicated in the course of inflammations of the liver, diaphragm, peritoneum, spleen, gall-bladder, &c., chiefly in consequence of contiguity of position. In these cases inflammatory action of a portion of the peritoneum extends to the opposite part of the peritoneal coat of the stomach, occasioning an exudation of lymph, and adhesion of the opposing surfaces, with more or less disease of this viscus. This succession or extension of inflammation from the surrounding viscera to the stomach is often observed in warm climates, especially among Europeans who have migrated thither.

29. Gastritis may be induced by powerful mental emotions, [as rage, grief, horror, anxiety, vexation, or other moral influences of a perturbating or depressing nature,] or mental shocks; or by the suppression of rheumatism or gout, or of any accustomed discharge; and these diseases may either be a predisposing cause (§ 25), some exciting cause having occasioned the gastric attack; or they may be the only efficient cause which can be detected, the gastritis even occurring without any circumstance which could account for the suppression or retrocession of either of these maladies. Most commonly, however, the stomach is attacked in the course of these, owing to errors of diet or regimen, or to the exhibition of irritating or inappropriate medicines or doses. Gastritis becomes, moreover, a prominent feature or complication of several fevers, especially those which have been denominated bilious by some writers, or gastric, owing to this feature, by others; and which are common in autumn or summer, or in warm climates. These fevers may assume a bilio-gastric character at these seasons, and may be either continued or remittent—the latter chiefly in malarious and warm climates. Indeed, there are few kinds of fever, especially in these seasons and climates, in which the stomach is not more or less prominently affected; and still more particularly in the exanthemata and in pestilential and malignant fevers. (See *arts.* Fevers, § 387, *et seq.*, and Pestilences.)

30. (*c*) Mechanical agents may produce gastritis by having passed into the stomach, or by acting externally. Broken glass, or various sharp or rough substances accidentally or intentionally swallowed, have produced this disease, [also lobelia and other acrid emetic substances]; while blows on the epigastrium and region of the stomach, falls, bruises, &c., and the reaction consequent upon such physical shocks, have been followed by similar results. Atmospherical changes and vicissitudes of temperature, especially when extreme; exposure to cold after the body has been overheated, and even any form of exposure when prolonged, have been considered sufficient to induce what some authors have described as a catarrhal form of gastritis, affecting the villous surface of the organ—various physical influences, as electrical states of the air, &c., being supposed by them to aid the operation of vicissitudes of temperature.

31. ii. Description.—*Gastritis* has been variously considered, in respect of its *seats and varieties*, by different writers. It has been *divided* into the *phlegmonous* and *erysipelatous* or *erythematic*, by Cullen, Pinel, Good, and J. P. Frank; by some writers into the *acute* and *chronic*, the phlegmonous being most frequently the former, the erythematic the latter, but to this division there are many objections; and to this correspondence of morbid states there are numerous exceptions. Hildenbrand admitted three species, namely, the *phlegmonous*, the *catarrhal*, and the *rheumatic*, either of which may be *acute* or *chronic*, these latter characteristics having reference only to severity of attack and period of duration. The catarrhal form of this writer corresponded with the erysipelatous of others. Broussais and Armstrong distinguished two species, *sero-gastritis* and *muco-gastritis*, assuming the serous and mucous coats of the stomach

to be respectively the seats of the phlegmonous and erythematic forms of the disease.

32. Of the accuracy of these divisions of gastritis very reasonable doubts may be entertained, arising from the phenomena observed during the life of the patient, and from the changes seen after death. The manner in which the disease appears, the state of vital energy at the time of attack, and the causes which have induced it, severally aid in determining the forms in which it may be arranged. If the disease supervene upon inflammation of the liver, or omentum, or peritoneum, it may be reasonably inferred that the serous coat of the stomach is first implicated, although it will be difficult to determine how far the other tissues are affected. Or, if gastritis arise from irritating substances taken into the stomach, from the regurgitation of acrid bile, or in the course of a severe dyspepsia, it is obvious that the villous surface is primarily and chiefly affected, although the other tissues constituting the parietes of the viscus often subsequently become more or less implicated. That inflammation may thus extend from either surface to one or more of the several tissues, of which the parietes of the organ are formed, will be admitted; and that this extension of the inflammation is more frequent than the simultaneous seizure of all the tissues or coats of the viscus, will also be allowed. But it is not improbable that this latter state of the disease may sometimes occur in a most severe or intense form, and when the causes are of an energetic or poisonous kind. In such cases, although the morbid impression may be directly made upon the villous surface, the whole of the tissues may, through the medium of either the connecting cellular tissue or the organic nerves, soon become affected, the villous coat, however, generally displaying the most marked alterations of structure, or the most evident signs of inflammatory action.

33. *Phlegmonous*, or *acute*, or *active gastritis*, therefore, is not, as *post-mortem* examinations fully prove, limited to the serous covering of the stomach, although often this coat is the tissue primarily or chiefly affected, as when gastritis supervenes upon, or is complicated with, inflammation of one or other of the adjoining viscera. But in the majority of instances of acute gastritis, occurring primarily or spontaneously, nearly all the coats of the organ are more or less affected, probably in a part only of the parietes, and especially the cellular tissue uniting the coats, and forming the matrix in which they, as well as the nerves and blood-vessels, are imbedded. That all cases of acute gastritis, however, do not commence in this manner, but that many, and these even the most severe, may originate in the villous surface, has been stated above (§ 31). Hence it follows that the *chronic* form of the disease is not the only form which is seated in this surface, and that, although most frequently thus seated and even thus limited, inflammation of the other tissues may also be possessed of this character.

34. Viewing, therefore, the several forms and states of gastritis, with reference to their causes, and to the modifying influences of season, climate, constitution, diathesis, and previous disease, it may be inferred, 1st, that gastritis, either in its commencement or progress, is not necessarily limited to a single tissue or coat of the stomach, although it may originate in one or other, or affect one or two or more of these tissues in a more marked manner than the rest; 2d, that the terms *phlegmonous*, *adhesive*, *erysipelatous*, *erythematic*, *catarrhal*, &c., are not precise as respects the seat and nature of the disease, nor appropriate when we regard the meaning usually attached to these terms; 3d, that *acute* and *chronic* have no reference to the particular tissue of the organ affected, but refer merely to the severity and duration of the disease; that these terms are extremely arbitrary, and that we have no absolute and precise range of activity and chronicity in respect of this disease, more than of any other; for gastritis may affect the more external or the more internal coats of the organ, as well as several or all of them, in every grade of severity and of duration, between the opposite extremes of activity and duration of existence.

35. In the following description of gastritis, I shall consider, 1st, the slighter forms of the disease, especially as they occur in the villous surface of the organ; 2d, the sub-acute or severer states of inflammations, as either supervening on the former, or commencing primarily, and extending to more than one of the tissues of the viscus; 3d, the most severe, malignant, or exasperated attacks of gastritis; 4th, the more prolonged or chronic forms of the disease; 5th, the complicated and consecutive states of gastritis; 6th, the terminations of gastric inflammations, &c. The diagnosis, prognosis, and treatment of the disease will afterward be considered in succession.

36. *A. The milder or slighter form of gastritis* may chiefly be referred to the villous or internal surface of the stomach. It is generally connected with a weak and sensitive state of the nerves of the organ. It is often consequent upon indigestion, especially when this affection is prolonged or improperly treated; and is then, as well as when it occurs primarily, occasioned by errors of diet, by unwholesome articles, by excesses in food or stimulating liquors, or by hot spices or sauces. In this form of gastritis, the patient complains of general uneasiness, referrible chiefly to the stomach, and especially after having taken food; of nausea, flatulence, distention, sense of heat in the organ; of thirst, dryness of the tongue or fauces; of acid, acrid, or rancid eructations, causing a sensation of acridity or an unpleasant irritation in the throat and fauces, and occasionally vomiting, especially after fluids are taken into the stomach. The tongue is red at the point and edges, and often loaded at the root and centre. Chilliness, general malaise, incapability of exertion, heat of the palms of the hands and soles of the feet, a slight acceleration of pulse, and tenderness at the epigastrium on firm pressure, costiveness, lowness of spirits, anorexia, loathing of food, excepting what is relishing or stimulating, and which, when taken, increases the complaint; sometimes vertigo and palpitations are more or less experienced.

37. This mild form of gastritis may occur primarily from the causes mentioned above (§ 25, 26), or consecutively upon indigestion; or in connexion with severe catarrhal or bronchial attacks, with which, especially with catarrhal fever and influenza, it is often a more or less prominent *complication*. It also forms a very marked pathological condition, in connexion with others, during the incubation and development of the exanthematous fevers, especially scarlatina and small-pox; and it is a more or less marked com-

plication or pathological condition in gastric, in gastro-enteric, and bilious fevers, and at the commencement of several other fevers. (See *art.* Gastro-enteric Disease.)

38. In this form it is presumed that the villous or mucous membrane of the stomach is only affected, and that this tissue is merely in a state of irritation or hyperæmia, and either partially or to a greater or less extent as respects this surface of the organ. It is often relieved or entirely removed in the course of a few days by abstinence, or the use merely of emollient articles of food taken in small quantities; but it is often also of much longer duration, either becoming *chronic* or passing on to more serious disease—to either a sub-acute or an acute form of gastritis, or to very dangerous organic change. These results most commonly follow, more or less slowly or insidiously, although sometimes rapidly upon injudicious treatment—upon the use of stimulants and tonics, or upon habitual excesses in food and intoxicating beverages. In many cases, the disease continues for months without much increase; in others, the inflammatory action becomes more general over the villous surface, or extends more deeply in the parietes of the organ. The morbid irritation may, moreover, become concentrated in the mucous follicles, and after an indefinite, but generally a protracted period, may lead to ulceration, and even to perforation of the viscus. In young subjects, especially those who are imperfectly nourished and respire an unhealthy atmosphere, the form of inflammation, existing in an asthenic state, may induce softening of the villous and sub-cellular tissues, with either thickening or even thinning of the coats of the organ.

39. Attacks of mild gastritis, in varying grades of severity, are frequent in persons subject to dyspepsia, or who are guilty of excesses in eating and drinking; and they often subside or disappear spontaneously, shortly after the causes are no longer in operation, the secretions and exhalations from the villous surface and follicles of the organ favouring the occurrence of resolution of the inflammatory condition. Hence abstinence or a moderate abstemiousness is the best mode of cure, unless medicines be prescribed with much caution, and be carefully suited to the morbid conditions, which are generally not merely inflammatory irritation or hyperæmia of the villous coat and follicles, but also weakened or exhausted energy of the ganglial nerves actuating the organ. As respects either state, it is better that it should be allowed to recover itself, through the influence of vital resistance, than that it should be perpetuated by irritants or otherwise inappropriate means.

40. *B. Sub-acute gastritis* is generally limited to the villous surface, or probably is extended in parts to the sub-villous cellular tissue. It generally results from the same causes as have been already noticed (§ 25, 26), and may be present as a prominent affection or complication of the same exanthematous and febrile maladies (§ 28), and in the advanced stages of tubercular consumption. It may occur primarily, although not frequently; or it may follow the milder form of gastritis, owing to errors of diet or regimen, or inappropriate treatment. It sometimes is consequent upon, or is associated with œsophagitis, or pharyngitis, or both; and not infrequently it is accompanied with inflammatory irritation or action in the duodenum and small intestines (see *art.* Gastro-enteric Disease). It is in most respects, as regards its causes, associations, symptoms, and terminations, similar to the mild form already described, the difference being only in the greater severity of the symptoms characterizing this.

41. In sub-acute gastritis there are pain, or sense of heat at the epigastrium, frequent retchings and vomitings, especially after substances, in any considerable quantity, are taken into the stomach, and the matters brought off the stomach are generally ropy, colourless, and abundant, or coloured by bile of a yellowish or greenish hue. Chilliness or slight shiverings often precede and attend the pain and vomitings, with a sense of anxiety at the præcordia, and tenderness, fulness, or distention at the epigastrium, depression of spirits and of strength, a dark or sallow circle around the eyes, a loaded tongue, the point and edges being red or indented by the teeth, or the surface more generally red, and the papillæ elevated, with great thirst and desire of cold fluids. The bowels are costive; and the urine is scanty, high-coloured, and generally presents an acid reaction. The pulse is frequent, soft or broad, open or compressible; the skin dry and feverish. The breathing is frequent and shallow, and the patient either sits up for a time or lies on his back in bed. All kinds of food, especially animal food, are loathed; or, when tasted, excite nausea or vomiting, which generally also follows warm drinks, especially tea.

42. This form of gastritis is often *complicated* with inflammation of adjoining portions of the digestive villous surface; but it also sometimes occurs *primarily*, and in an uncomplicated form, especially in young subjects, after debauches, or the excessive ingestion of spirituous or vinous beverages; or after copious draughts of cold fluids when the body is perspiring, or even in other states of the frame. It generally subsides when a suitable abstemiousness or abstinence is enforced, or when otherwise judiciously treated. But it may lapse into a more *mild*, but often a more *chronic* state; and even go on to a more severe, or a disorganizing form, ultimately *terminating* in some one or other of the structural lesions, which will be described hereafter. When associated with inflammatory irritations of the intestinal villous surface, the bowels are more or less relaxed, the febrile symptoms sometimes more marked and attended by frontal headache, and by pains in the back and limbs (*see* Gastro-enteric Disease). Sub-acute, as well as mild gastritis, although it may affect the coats of the organ to some depth, and in parts only, very seldom proceeds so far as to implicate the serous surface, unless the mucous follicles have become ulcerated, and the ulceration has reached the peritoneal membrane. In this case, the sub-acute state of disease has generally degenerated into the chronic before this advanced lesion has taken place.

43. *C. Acute or severe gastritis* occurs, 1st, primarily or directly from its occasional causes; 2d, consecutively upon the milder forms of the disease already noticed, owing to the persistence of the causes or to improper treatment; and, 3d, from the extension of inflammation from adjoining viscera. It may present various grades of severity or violence, owing to the greater or less extension or intensity of the morbid action, and virulence of the exciting cause, relatively to the

state of constitutional power; and, in any of these grades, it may be a prominent affection in the course of the more malignant forms of the exanthemata, of fevers and pestilences. Acute gastritis is rare as an idiopathic malady, and unassociated with inflammation of any other organ, unless when it is produced by poisons, or by substances which, from their quantity or condition, act as poisons, as the ingurgitation of spirits, or of very cold or very hot fluids, &c. M. ANDRAL records a case in which fatal gastritis followed a severe mental shock, the stomach alone presenting the results of inflammatory action.

44. (*a*) When gastritis is produced by *irritant poisons* (see *art.* POISONS, § 109, *et seq.*), the local symptoms are instantly developed, and when the poisons are of an acrid or corroding nature, they assume the most intense features. The pain at the epigastrium is most violent, burning, pungent, or lacerating; often extends from the pit of the stomach to the spine, or to both hypochondria, and is attended by extreme anxiety, mental and physical depression; by constant retchings, the matters ejected varying with the contents of the stomach at the time of ingestion of the cause, and with the nature of the cause (*see* POISON, § 54). The retchings aggravate the sufferings, and return on each occasion when the irrepressible thirst impels the patient to drink. The breathing is shallow, and increases the pain; the supine position, with the knees drawn up, or a semi-recumbent posture, being generally assumed. The slightest pressure increases the patient's sufferings. The vomitings are most painful, and, after the contents of the stomach are thrown off, consist chiefly of the fluids last taken, sometimes coloured by bile, and containing a little mucus, or glairy matter streaked with blood. With the intensity of the symptoms, the prostration of the patient increases, and the features are more sunk, and expressive of greater anxiety. The epigastrium and hypochondria are generally tumid or tense, and the temperature of these regions is much augmented. The skin is hot, dry, and harsh at an early period, and the cheeks sometimes flushed, while a dark circle surrounds the eye, and sometimes also the mouth, the countenance being expressive of extreme anguish; and distressing anxiety is referred to the præcordium and epigastrium. The tongue is either red throughout, or only at the point and edges, the middle and base being covered by a thick fur. The pulse is frequent, and at first constricted or small. The urine is scanty and high-coloured. The bowels are costive; but when the cause, especially when it consists of some poisonous substance, has passed the pylorus, and inflamed the intestinal mucous surface also, diarrhœa and purging may accompany the retchings and vomitings.

45. As the disease proceeds the symptoms assume a worse character; and, according to the intensity of the cause, especially when this is of an acrid or corrosive nature, the progress of the disease is rapid, and its duration short; a fatal termination sometimes taking place in a few hours, although most frequently not until the second, third, or fourth day, unless in the most violent cases. When the disease proceeds thus unfavourably, the pulse becomes rapid, very small and thready, sometimes irregular, intermittent, or slow. The extremities are clammy or cold, while the trunk is still hot and even dry. The features are sunk or pinched, pallid or sallow. The thirst and burning heat in the region of the stomach continue, and the pain is attended and aggravated by frequent flatulent eructations, or by hiccough accompanied by eructation, and at intervals, or soon after fluids are taken, by vomiting without much effort, or without retching, the matters thrown off being as if eructated from the stomach. During the disease the desire of cold fluids, or of iced water, continues; and ultimately, after hiccough has been present for a short time, the pain is diminished, or ultimately ceases; but the features, pulse, and temperature sink more and more. The extremities and surface become more clammy and cold, and the pulse disappears. Death rapidly follows, the mental faculties being unaffected, or continuing without manifest impairment until the last, unless the cause of the attack has been of such a nature as not only to inflame the stomach, but also to disorder the nervous and mental manifestations. When the disease and the operation of its cause are limited to the stomach, or to this viscus and adjoining portions of the digestive canal, death is the result of the extent of lesion or disorganization, being such as exhaust or depress organic nervous and vital power to such a degree as is incompatible with the continuance of the heart's action; the intimate connexion of the affected viscus with the centres of organic nervous power rendering all severe affections of the former most depressing to the latter, and ultimately annihilating its manifestations when they reach a certain grade.

46. When acute gastritis is produced by less intense causes, or when it is consequent upon inflammation of the liver, or of some other part, the serous membrane becoming implicated, the history of the disease is modified from the foregoing, gastric symptoms supervening, with more or less severity, upon those characterizing the primary malady. The consecutive gastritis thus developed, although often both acute and severe, is seldom so intense as the form now described; and a fatal termination, which is very frequently the result, is generally longer delayed than when gastritis is produced by the more intense causes, especially by acrid or irritant ingesta. When the disease extends to the serous membrane from adjoining parts, a portion only of this membrane is at first attacked, although the inflammation may soon be much farther extended. Whereas, when a deleterious substance is taken into the stomach, the injurious effect is more widely extended, and more intense, unless this substance be in great measure intercepted by the contents of the viscus, and thrown off with these contents by vomiting (see *art.* POISONS, § 51, *et seq.*). When acute gastritis is consecutive of inflammation of adjoining parts, and is not arrested or relieved by treatment, it presents more or less of the characters described above (§ 44, 46), generally in a somewhat less intense and less rapid form, death, however, often occurring in the course of a few days, or sometimes being delayed to two or three weeks. In some cases the disease may lapse into a subacute, or even chronic form, and be prolonged to some indefinite period.

47. Acute gastritis may supervene upon either the mild or the sub-acute form; or gastritis in a slight and chronic state may have long existed, and ultimately an acute attack may be developed, owing to the operation of one or more of the causes already enumerated. In some cases, a judicious treatment may reduce the acute attack to

the state which preceded it, but more frequently the severe symptoms depress and ultimately exhaust the patient. Primary acute gastritis, when early or judiciously treated, or even when treated in such a manner as may not interfere with the salutary changes brought about by the efforts of nature and by vital resistance, terminates favourably in many cases, a cooling and soothing treatment, with abstinence, bringing about resolution. But not infrequently the disease either proceeds in the manner above described (§ 45, 46), or in a less intense or rapid form, to dissolution; or it is so far ameliorated as to assume a sub-acute or a mild form. In either of these latter cases, it may be farther relieved or altogether removed, or it may continue in a chronic state.

48. *D. Chronic gastritis* is most frequently either the mild or sub-acute state of gastritis rendered obstinate, or prolonged by neglect, or errors of diet or regimen, or by injudicious treatment; it more easily follows an acute attack. In whatever form gastritis occurs — whether mild, sub-acute, or acute—if the cause which produced it be removed, and judicious means be used, the natural secretions of the viscus, by their free and abundant exudation, favour the occurrence of resolution. But if food or drink of an exciting, heating, or irritating kind be administered, inflammatory action is increased or perpetuated, and continues in some one of various grades, and attended by diversified symptoms for a very indefinite period. In its course, moreover, farther disorder or disease is developed, or pre-existing disorder is aggravated, and various complications arise.

49. The symptoms referrible to the stomach are often an aggravation of those characteristic of indigestion, or similar to those of the milder forms of gastritis. More or less pain is felt, is generally aggravated by food, or by much fluid, and is attended by heartburn, a sense of distention, and by tenderness on pressure. Anorexia and nausea are present, and occasionally vomiting occurs, the matters consisting of such as have been more recently taken, or of a glairy fluid with mucus. Instead of pain, a sense of gnawing, of craving, or of sinking is sometimes experienced; and either of these may be accompanied with flatulent or acrid eructations, with fulness or tension at the epigastrium, or with a feeling of distention or of heat, and general discomfort. The appetite is either altogether lost, or it is craving, gnawing, and morbid, articles which are most inappropriate being desired. These articles generally aggravate the pain, or occasion vomiting, and increase the thirst, which is generally present. A foul, or loaded, or furred tongue, the point and edges being red, or indented by the teeth; an unpleasant taste in the mouth, or a vitiated taste; heartburn, or a sense of acidity of the stomach, with frequent acrid, acid, fetid, or rancid eructations; costiveness, or an irregular state of the bowels, the stools being often deficient in bile, or of a very dark bilious appearance, and offensive, are generally experienced. The urine is either scanty, clear, and high-coloured, or paler, turbid, or phosphatic. Chilliness and feverishness, frequently with frontal headache; a dry, harsh, or scaly state of the skin; general malaise, want of physical power, and defective mental energy and application, are commonly complained of.

50. With the continuance of the complaint, numerous sympathetic feelings and disorders are manifested. The several senses are often slightly affected. The mind is always engaged with the bodily feelings, which become exacerbated, or are exaggerated by the constant attention directed to them, the disorder often approaching the character of hypochondriasis, or even passing into this complaint. The temper is irritable and uncertain. In many cases, the pharynx and fauces present a similar state of chronic irritation, with congestion or inflammation, as may be presumed to be present in the stomach, and the irritation sometimes extends to the epiglottis or larynx, and is perpetuated by the acrid eructations which occur. In these cases, a dry stomachic cough is complained of, a fit of which sometimes is followed by retching or even vomiting. Palpitations, with increased frequency or irregularity of the pulse, are often experienced. Occasionally the tongue presents patches, as if deprived of its epithelium in parts. It is generally loaded or furred at its base, and the follicles swollen. Sometimes the surface is red, smooth, and shining throughout, or it is variously fissured. The gums are swollen or spongy, and fall or recede from the teeth. According to the severity and duration of the disease, numerous other sympathetic affections are developed, continue for a time, and disappear, or become permanent. The disease thus proceeds for an indefinite time, and is either ultimately relieved or removed, or it exhausts and emaciates the patient, and superinduces organic lesions of the stomach, especially at the cardia or pylorus, or disease of the liver, lungs, pancreas, or kidneys, the complication often terminating life.

51. ii. Appearances on Dissection. — The changes produced by the milder forms of gastritis—by the mild and sub-acute—are rarely observed, unless when they occur at an advanced stage of some chronic disease, as tubercular consumption, hectic fever, &c. These changes, as well as those which are produced by acute gastritis, have been very fully described when treating of the morbid anatomy of the alimentary canal (see *art.* Digestive Canal, § 21, *et seq.*) and of the effects of Poisons, under which head the alterations produced by the several corrosive, irritating, and other poisons in the stomach are circumstantially detailed. In the more sub-acute and chronic states of gastritis, especially as observed in drunkards, or in persons addicted to excesses in eating, are chiefly a dark, reddish-brown, or slate-gray, or blackish-blue discoloration of the villous membrane, thickening, increased condensation, or induration of this membrane — a hypertrophy, presenting itself in various grades (see *art.* Digestive Canal, § 27, *et seq.*). The pyloric portion of the stomach is generally the chief seat of the more chronic inflammation of the stomach, the sub-mucous cellular tissue and the muscular coat participating in the hypertrophy in various degrees, the parietes of the viscus chiefly in and near this portion presenting increased thickness and hardness. In some of these cases, the stomach contains, or presents on its internal surface a grayish or colourless glairy mucous secretion in considerable quantity. In cases of acute gastritis complicating exanthematic fevers, or caused by some kinds of poisons, flocculent exudations, or even partial formations of false membrane, are sometimes found on the mucous surface.

52. Idiopathic inflammation of the internal

coats of the stomach, involving chiefly the submucous and connecting cellular tissue, and terminating in suppuration, is very seldom observed. Inflammations thus seated and thus terminating are oftener met with consecutively of or associated with some other malady. In these cases, the parietes of the stomach are thickened, owing to the sub-mucous tissue being distended with pus, this tissue being softened and friable. The mucous membrane itself is generally injected and red. In some parts this membrane is perforated by numerous irregular cribriform openings, through which the pus escapes into the cavity of the stomach. The various organic lesions of the stomach consequent upon gastritis, or upon constitutional or other causes, are fully described under the head Digestive Canal (§ 18, *et seq.*), and, as respects their symptoms and treatment, are considered in the sequel.*

53. iii. Diagnosis of Gastritis.—*Peritonitis*, especially when circumscribed or limited to the viscera or regions of the upper part of the abdomen, may be mistaken for gastritis, as the prostration, pain, vomitings, retchings, &c., may be as great in the one as in the other. But the situation of the pain, the great tenderness, especially at the epigastrium, the sense of burning there, the character of the thirst, and desire of cold or iced fluids; the mucous and glairy, or ropy matters vomited, sometimes streaked with blood; the appearance of the tongue, and the not infrequent recognition of the exciting cause, generally indicate the nature of the malady. When gastritis is consequent upon hepatitis, or splenitis, or omentitis, or diaphragmitis, as sometimes observed, especially upon the first of these, the diagnosis may be more difficult. But the history of the case, and the appearance of severe gastritic symptoms during the course of hepatic disease, or of the other inflammations, will indicate this extension of the morbid action. When more general peritonitis is present, the diagnosis is more manifest; inasmuch as the painful symptoms extend much lower; while in gastritis they ascend to the base of the thorax, and are generally attended by a greater amount of anxiety, extending frequently to the præcordia. When inflammation affects the opposing peritoneal surfaces of the stomach and liver, as not infrequently found after death, especially in warm climates, the symptoms are often equivocal in respect of either organ. The complication may, however, be inferred from the characters of the early symptoms, and of those more recently developed.

54. The diagnosis of the milder and more chronic states of gastritis is much more difficult than that of the acute. The not infrequent temporary relief of pain and other symptoms of the former, by stimulants and carminatives, frequently suggests the existence merely of indigestion or morbid sensibility of the organ, whereas a mild or chronic state of inflammation of the mucous surface may exist nevertheless. But when pain is present in the region of the stomach, and is increased by pressure, or by food, and by warm fluids; when vomiting of a ropy and abundant mucus takes place; and when the throat, fauces, and gums are red or inflamed, this form of gastritis may be truly inferred. The aggravation of pain, or the production of vomiting, by warm tea, or other warm fluids; a dry and scaly state of the skin; the presence of papular or other eruptions on the skin; the relief following the use of cooling fluids, and an abstemious or low diet; the spongy or inflamed gums; the red papillated, aphthous, or fissured states of the tongue; or a dry, red, or smooth and shining appearance of this organ; and heat in the palms of the hands, or soles of the feet, are severally indications of mild or chronic gastritis, especially when observed in connexion with slight febrile symptoms, and an alteration in the secretions and excretions.*

* [Prof. W. E. Horner, in his able article, "Inquiries into the healthy and diseased Appearances of the Mucous Membrane of the Stomach and Intestines" (*Am. Journ. Medical Sci.*, vol. i., 1828), showed very clearly that an acute inflammation of the stomach may persist many days, and even terminate fatally, and yet present no very striking redness of the internal membrane, and, consequently, that it is impossible to estimate the state of irritation of an organ during life solely by the quantity of blood left in it after death. Dying seems to have the effect of concentrating more and more towards the heart the vital powers and the fluids, or, in other words, withdrawing them from the circumference to the centre. "In speaking with Dr. Physick," says Prof. H. (*loc. cit.*), "on affections of the stomach, he told me that his experience led him to think that the highest grades of its irritation were attended neither by pain nor vomiting. The state of inflammation is so exalted, that its effects approximate those of the most deleterious poisons, which cause sudden death, without local pain, fever, or any very sensible derangement of the functions, except mere weakness and a sense of illness," and cases are given in illustration of this. We have observed instances of this kind, especially where a large dose of some powerful irritant had been swallowed, but such cases are rare. It is very true, as Prof. H. states, that the traces of acute inflammation are, in many cases, very fugitive, and entirely disappear upon death, because, the local irritation which attracted the blood and accumulated it having ceased, the blood abandons that part, and retires towards the centre of the circulation. We can seldom tell by the appearances, 24 hours after death, the quantity of blood which has penetrated an inflamed membrane, as the cellular and mucous membranes, peritoneum, &c. "The eruption of measles and the redness of sore throat disappear on the death of the patient."]

* [Prof. N. Chapman remarks, that "the signs hitherto considered as most characteristic of *gastritis*, nausea and vomiting, a sense of heat and burning in the organ, with intense thirst, tenderness of the epigastrium on pressure, and a florid tongue, are equivocal or fallacious, and the latter two especially. Examples of actual phlegosis occur, in which no tenderness can be detected, this oftener, though not always, happening where there is extreme obesity, the stomach being so protected by a cushion of adipose matter over it, that the effects of pressure, or even punching, do not reach it. Conversely, such is the sensibility of some attenuated persons, that they will flinch, and complain of pain in a perfectly healthy condition of the organ. Some of the highest of the French authorities seem to attach scarcely any importance to the indications from the tongue. By Andral we are told that no constant relation can be established between its appearances and the states of the stomach; that the one is often entirely natural, when the other is greatly diseased, and, contrarily, it may manifest every aberration in the soundest ventricular condition. No doubt such is the fact, having seen proof of it, and especially in relation to a scalded-like appearance of the tongue. But here it may be remarked, that this appearance is uniformly preceded by much gastric distress, nausea or vomiting, with a sense of burning heat in the stomach, all which is relieved on occurrence of the affection of the tongue; and hence it may be inferred that the phenomenon is owing to metastasis of the irritation of one to the other organ. Nor is it improbable that this explanation is of more general application in cases of the kind. Certainly I have seen gastric disturbances of every variety, where mitigation or entire relief was afforded from the assumption of the primary irritation by the tongue, the mouth, the throat, or even the face. These parts, on such occasions, perform the office which is more commonly done by the general tegumentary tissue, in the form of a wide-spread eruption. Louis, however, affirms that, whatever may be the state of the tongue, it has no concern with the disorders of the stomach, it exhibiting the same appearance in the most opposite conditions of the viscus, in the healthy and depraved; and, indeed, declares, that in those instances where the 'mucous membrane presented the greatest suffering, the tongue was unaffected.' Granting this fact, which is not improbable, the explanation of it is to be sought in the circumstance of the continued concen-

55. iv. The Prognosis in the milder forms of gastritis, and even in the chronic states, before serious complications have been developed, is generally more or less favourable, provided that a judicious treatment, especially in respect of diet, regimen, and air, be adopted and persevered in. When, however, organic disease of some vital or important organ has either preceded or been developed in the course of these states of gastritis, a very unfavourable issue may be anticipated, or may be near at hand; mild, sub-acute, or chronic gastritis, or gastro-enteritis, or even gastro-œsophagitis, with troublesome irritation of the pharynx or fauces, very commonly characterizing the far-advanced stage of hectic and organic visceral diseases.

56. In acute gastritis, the prognosis depends much upon the exciting cause. When this is of a very corrosive or acrid nature; when it has not been entirely removed from the stomach, and when this viscus was empty when it was taken; when the injurious matter is not only acrid or irritant, but also depressing to the organic nervous energy, a very unfavourable issue may be expected, even at an early period of the disease. If, however, the cause be altogether removed, and a diminution of the sufferings or of the vomiting be remarked; and if appropriate means be retained on the stomach—if the painful symptoms abate, and none of the most dangerous appear—if the matters vomited be neither streaked with blood nor sanious—if neither singultus nor cold perspirations be present—if the anxiety, distress, and restlessness be relieved—if the character of the pulse, respiration, and of the sympathetic disturbance improve; and if the disease be primary or uncomplicated, a favourable issue may reasonably be expected, if no error in diet or regimen be committed, so as to increase or to rekindle the inflammatory action. When acute gastritis appears in the course of exanthematous or other fevers; or when it is consecutive of hepatitis, or of inflammation of one or other of the adjoining viscera, the prognosis should be extremely guarded, for the extension and complication of disease may be attended by great danger, although the symptoms may not appear very severe. In these cases especially, the extent and exact seat of lesion are not easily determined, the degree of prostration, the character of the pulse, the state of the abdominal surface and of the extremities, the anxiety and appearance of the countenance, the position of the patient, and the nature of the retchings and matters vomited, severally guiding the prognosis.

57. v. Treatment.—The treatment of the several forms of gastritis should be conducted with the same intentions for each; namely, 1st, to remove the exciting cause; 2d, to subdue the inflammatory action produced; 3d, to avoid whatever may irritate or excite the stomach by its properties, or the quantity taken; and, 4th, to restore the healthy functions of the organ.—*A. The milder forms of gastritis* are generally caused by errors of regimen, especially in respect of food and drink, and in many cases they require merely abstinence, or a mild, farinaceous, and abstemious diet for their removal. But in some constitutions, and in others where abstemiousness is not observed, the complaint, although mild at first, becomes either chronic or exasperated, and, in addition to a strict regimen, various other means are required. These means should be suited to the age, constitution, and power of the patient, and the severity of the disease. Generally, the application of leeches over the epigastrium, followed by rubefacients, especially the terebinthinate embrocation, and the administration of emollients, with refrigerants, &c., are sufficient to remove the milder states of disorder. Small doses of the nitrate of potass, given in the mistura amygdalæ, with hydrocyanic acid, are usually of service. The bowels should be kept freely open by means of cathartic enemata. A moderate dose of calomel may be given at bed-time, early in the disease, especially when the functions of the liver are impaired; and its operation may be increased by about twenty or thirty grains of calcined magnesia in the morning, followed by a glass of lemonade immediately after the magnesia is taken; or a drachm of citrate of magnesia may be prescribed in any mild vehicle. Even when retching or vomiting is present, the above means usually afford relief in a short time, especially when the *third* indication is duly enforced and abstinence is observed, the mildest farinaceous articles only being taken in small quantity.

58. *B.* In the more *acute* or *severe cases* of gastritis, the removal of the exciting cause should be instantly attempted; and if this be of a poisonous nature, the means advised for this purpose in the article Poisons ought to be employed. Vascular depletion should be promptly ordered, the amount being regulated by the age and strength of the patent, by the state of the pulse, and more especially by the nature of the exciting cause. In most acute cases, and at an early period, one general *blood-letting*, which may be followed by the application of leeches to the epigastrium, or by a repetition of the local bleeding, and by a blister, or a rubefacient embrocation or epithem, is requisite. In some cases, especially when the disease is not occasioned by poison, a full dose of calomel, at an early period, is of much service, and tends remarkably, especially when given with magnesia in the form of powder, to allay the irritability of the stomach; but medicines should be sparingly given by the mouth, those already mentioned (§ 57) being the most appropriate. When the vomiting is urgent, and the sense of heat at the stomach great, the nitrate of potash may be given, as above combined, more frequently, and two or three drops tinctura opii may be added to each dose. But the quantity of the vehicle should be small and emollient or mucilaginous, and effervescing mixtures or large draughts avoided. Small morsels of ice, [frequently swallowed,] and the citrate of ammonia, or of soda, or of magnesia, in weak solution and in small quantity, are generally beneficial, the latter especially when the bowels are not sufficiently open.

59. At an advanced stage of acute gastritis, when vomiting is almost constant and without much effort, or when blood is brought up with other matters, or when the pulse is sinking or irregular, it becomes a question what means should be adopted, or whether any can be of service. In

tration of the irritation in the stomach, no part of it having escaped to the tongue. But Piorry asserts, that 'in numerous instances of pure gastritis the tongue continues pale.' While I admit, generally, that the indications of the tongue have heretofore been too implicitly relied upon as criteria of gastric disturbance, I am not prepared to go to the extent of coinciding in the decision of the writers whom I have quoted."—*Lectures on the more important Diseases of the Thoracic and Abdominal Viscera.* Philadelphia, 1844.]

these almost hopeless circumstances, where fatal disorganization of the stomach is expected, I have sometimes prescribed the spirits of turpentine by the mouth, in small and repeated doses, in the form of an electuary with aromatics (see *art.* Spleen, § 69), and a turpentine epithem to be applied at the same time over the epigastrium and abdomen. In many instances, such doses of tinctura opii as the peculiarities of the case may suggest, and very small doses of creasote, may be added to the electuary. (*See Author on the Use of Terebinthinate Remedies in Disease, in Lond. Medical and Physical Journal for* 1821.) In several instances, when this treatment has been prescribed in these circumstances, the vomiting has ceased almost immediately, and the patient has ultimately recovered.*

60. *C. The chronic states of gastritis* require means which their antecedents and causes chiefly should suggest. In some cases, especially when indications of exacerbation from errors in regimen present themselves, leeches applied on the epigastrium are necessary, and the repetition of them, after various intervals, should not be overlooked. Generally, a few leeches, and a frequent repetition of them, are more beneficial than a great number applied at one time. After these, warm embrocations, rubefacient plasters, [croton oil,] or even blisters, are of service. But in most of the chronic states of the disease, whether simple or complicated, diet and regimen should receive the strictest attention. In some instances, the mild preparations of mercury, suitably combined with gentle laxatives or aperients, are of great service, and when the liver is torpid, they can hardly be dispensed with. When chronic gastritis is complicated with enlargement of the liver, calomel, or other mild mercurials, conjoined or alternated with purgatives, [or, rather, mild laxatives,] and aided by the deobstruents advised for this state of the liver (see Liver, § 245, *et seq.*), should not be omitted.

61. *D.* In most cases, when *pain* or *spasm* is referred to the stomach in the course of this state of disease, hydrocyanic acid, in mucilaginous or emollient mixtures, or with a weak solution of any of the alkaline carbonates, or with lime-water and milk, is generally productive of benefit. In these cases, also, the nitrate of bismuth, or the oxyde or nitrate of silver, combined with very small doses of ipecacuanha (from the sixth to the quarter of a grain), and opium or henbane, is of great service. The oxyde or the sulphate of zinc, in small doses, is also very beneficial, when combined with anodynes. Dr. Wood remarks, respecting the nitrate of silver, that from a quarter of a grain to a grain is often administered two or three times a day with advantage. Cures in most obstinate cases have been obtained from this substance. It has appeared to be most serviceable in those cases which are attended by vomiting, and in which the tongue is smooth and glossy, as if deprived of the papillary structure. I have, for many years, been in the habit of prescribing the nitrate intimately triturated with narcotics in these cases, and in the chronic states of gastritis complicated with palpitation, or with irritation of the intestinal mucous membrane.

62. When convalescence commences and advances, the mild vegetable tonics, especially the infusion of columba or of cheireita; subsequently the chalybeate preparations; and the diet, regimen, and mineral springs, or artificial mineral waters, advised when treating of Indigestion and Hypochondriasis, should be resorted to, according to the circumstances of each case. In most instances, travelling, change of air and of scene, gentle but agreeable mental occupation, relaxation from the anxieties and mental tension of continued application to business, moderate exercise in the open air, and diversion of the mind from such feelings and slight dyspeptic disorders as generally attend convalescence from gastritis, are generally most beneficial, and always requisite for a very considerable period after inflammatory affections of the stomach.

III. Organic Lesions of the Stomach.—Classif.—IV. Class, I. Order (*Author in Preface*).

63. *Alterations of structure* seated in the stomach are frequently the consequences of inflammation; but they may, in other cases, result from chronic irritation, and, in different circumstances, from vital depression, or from constitutional taint. Cancerous lesions proceed chiefly from this last cause, aided probably, or at least in some instances, by prolonged irritation, or by impaired vital power. Organic lesions of the stomach may thus be viewed as the more or less remote results of *Indigestion*, of *Hypochondriasis*, of *Morbid Appetite*, of *Pyrosis*, and of the *Nervous*, *Spasmodic* and *Inflammatory affections* now passed in review. Consequently, the Causes of these organic changes are those which are productive of the primary affections from which they spring.

64. The *Stomach* is liable in a very marked, and in a very special manner, to all the lesions which I have fully described when treating of the *structural alterations* of the Digestive Canal. To that article I must refer the reader for a general description of the lesions implicating the stomach; but some of those are so frequently seated in this viscus, or in its cardiac and pyloric orifices, and occasion special forms of suffering, as to require particular consideration at this place. Of these lesions the most important are, *ulceration* and *perforation*, *softening* and *disorganization*, *thickening*, *scirrhous degeneration*, and *carcinoma*, of the parietes or of the orifices of the stomach.

65. i. Ulceration and Perforation of the Stomach.—*A.* Ulceration is very rarely an acute disease when seated in the stomach, and it is generally single, or very seldom consisting of more than one, unless when seated in the follicles. The *form* of the ulcer is usually round or oval, but it is sometimes irregular, rarely linear. It may exist in any part of the viscus. Its *margin* is either grayish, pale red, or of a deep brown, and of natural thickness and consistence, or softer, thinner, harder, or thicker than natural. In some cases, the surrounding sub-villous tissue is thickened and indurated. The *bottom* of the ulcer consists of different tissues, according to the depth the ulceration may have penetrated. In some instances, it is so slight as to appear as an abrasion; more frequently, however, the villous coat is penetrated, and in some the sub-mucous, the muscular, and even the peritoneal coats, are successively penetrated. When this last tunic is reached, as well as previously to this stage, various appearances and changes are developed which are fully described under the head

* [We have derived very great advantage from minute doses of *creasote* in these cases. The *oil of copaiba* is also often useful.]

Digestive Canal (§ 37, *et seq.*). The ulceration may thus proceed to perforation, without or with adhesion of the opposite surfaces of the peritoneum, around the seat of perforation. In anæmied or cachectic persons, and not infrequently in chlorotic or anæmied females, adhesions are not often formed, and the ulceration proceeds, without manifest signs of inflammation or increased vascularity, and the coats are corroded, as in phagedenic ulceration, until the peritoneal lining is either softened, or ruptured from distention of the stomach, or during an attack of vomiting following a meal, and a portion of the contents of the viscus passes into the peritoneal cavity, causing peritonitis and death in a short time. The ulcer in many of the cases presents the appearance as if the ulcerated portion were punched or stamped out of the gastric parietes, the margins often presenting no farther changes than slight discoloration or injection, sometimes with thickening of the cellular tissue.

66. The ulceration may be *cicatrized*, as shown in the article just now referred to (§ 39), or it may proceed onward, after adhesions have been formed between the opposite portions of the peritoneal membrane, and thus the ulceration may proceed not only to perforation of the stomach, but also to perforation of a contiguous portion of the digestive canal, as the colon, or to more or less ulceration or perforation of another organ. In a female under my care during two or three years for severe dyspepsia, with recurring attacks of chronic gastritis, attended by vomiting, the paroxysm of vomiting being ultimately accompanied with discharges of blood, and the patient having been carried off by a violent attack of hæmatemesis, a large and deep ulceration was found in the stomach, which passed far into the substance of the liver, the peritoneal surfaces being firmly agglutinated around the perforation, and several of the vessels of the liver eroded. Where the bottom of the ulcer thus becomes agglutinated to an adjoining viscus, the contents of the stomach are thereby prevented from passing into the peritoneal cavity.

67. Of the various modes in which ulceration may take place, and of the consequences of this lesion, I cannot add anything to what I have minutely stated elsewhere (see Digestive Canal, § 37–44). I may, however, briefly remark, that, although usually commencing in the villous surface, ulceration and perforation may originate in a different situation, and proceed in an opposite direction, as when an abscess in the liver or in the spleen opens into the stomach, by the adhesions and perforations produced by the purulent collection. But there is even a *third* mode, not hitherto described, in which atheromatous or fatty deposits in the coats of an artery favour rupture of, or exudation of blood from, the diseased portion of vessel, whereby the villous coat is perforated or torn, and hæmorrhage into the stomach takes place. In rare cases, the hæmorrhage ceases, but the part from which it proceeded becomes the seat of ulceration, which may advance more or less, or even terminate in perforation. Ulceration and perforation of the stomach thus presents the following varieties: 1st. Erosion of the mucous membrane only, consequent upon chronic gastritis. 2d. Small ulcers, with red margins, more or less numerous, and scattered over an uninflamed surface, resulting from irritation or inflammation of follicles. 3d. Much larger ulcers, penetrating the muscular, or even the peritoneal coat, and often having the surface or substance of an adjoining viscus, as the liver, for their bottoms, or perforating a different portion of the canal, adhesions having formed around the ulcers: these are commonly single, oval or round, are most frequently seated in the small curvature, or near the pylorus, and present no cancerous characters. 4th. Ulcers with ragged and inflamed margins, caused by corrosive poisons, and seldom penetrating the parietes of the stomach. 5th. Ulceration and perforation from without inward, generally caused by an abscess of the liver opening into the stomach, adhesions of the peritoneum having formed around the ulcerated portion. 6th. One or more small ulcers, caused by atheromatous or fatty changes in the coats of the vessels, and by rupture of the villous membrane. 7th. Gelatiniform softening of the coats of the viscus. And, 8th. Carcinomatous ulceration, &c. (§ 77, *et seq.*).

68. *B.* The *symptoms* of ulceration of the stomach are very equivocal. Several cases of this lesion have come under my observation; most frequently, however, when they have gone on to perforation and its consequences. They have occurred most frequently to females engaged in needlework, or as domestics. In most instances, the patients have been more or less anæmied, or subjects of chlorosis, or of irregular, or painful, or scanty menstruation; and, although they had previously complained, for a longer or shorter period, of attacks of gastrodynia, or of spasm of the stomach, or even of attacks of vomiting, or of hæmatemesis, they have generally been able to pursue their avocations, and to take their food, up even to the period of the fatal seizure. The painful symptoms in these cases, as well as the attacks of vomiting or of hæmatemesis, usually followed a meal; and even when anæmia or cachexy was very manifest, no emaciation was generally present, the patient presenting much plumpness with the anæmia. The forms of ulceration and perforation, from the external to the internal tunics, and from disease of the vessels, are seldom observed, unless in persons of middle age, or far advanced in life; whereas the foregoing occurs most frequently in young females, although it is also met with in persons far advanced in age, and in males. In these there are generally evidences of a cachectic condition, and of a poor or morbid state of the blood. In addition to the symptoms already mentioned, in some cases, a gnawing sensation at the epigastrium, emaciation, flatulence, and various other dyspeptic disorders are experienced; but the appetite is often not much impaired, and, in some instances, neither the pain nor the vomiting is severe until the peritoneal covering is reached, or until perforation and its consequences occur. The attacks of hæmorrhage, in connexion with one or more of the symptoms already mentioned, are among the most certain indications of the lesion. But it should not be overlooked that hæmatemesis occurs chiefly when much blood is poured out from the ulcerated part in a short time; for when the hæmorrhage is slight, frequent, and prolonged, the blood may pass the pylorus, and either be partially digested or more or less changed, and, mixing with the stools, be altogether overlooked. In this way, much of the anæmia observed before the fatal issue may be produced, hæmatemesis being either

slight or altogether absent. When the hæmorrhage is not great, the matters vomited often have the appearance of coffee-grounds; and in most cases, even when vomiting does not occur, the stools present a black or pitchy hue. These symptoms also attend malignant ulceration or carcinoma of the organ; but the absence of circumscribed hardness or tumour, and of the other symptoms of this latter malady (§ 78, *et seq.*), will assist the diagnosis.

69. *C. Treatment.*—The indications of cure are the same as advised for chronic gastritis (§ 60, *et seq.*). Mild farinaceous articles of food, or such diet as the patient finds to agree the best, and a judicious recourse to sedatives or narcotics, are the means most generally appropriate. The vomitings, especially of blood, often require to be arrested, and, with this intention, the means advised for *hæmatemesis* (see *art.* Hæmorrhage, § 174, *et seq.*) may be resorted to; or the spirits of turpentine may be exhibited in any suitable form, with or without small doses of creasote. If indications of perforation are manifested, by the occurrence of the symptoms of circumscribed or general peritonitis, large or repeated doses of opium, as recommended by Dr. Stokes, are chiefly to be relied upon, with such other aids as are advised when treating of this subject in the article on Peritonitis.

70. ii. Softening and Disorganization of the Coats of the Stomach.—This subject has received attention when treating of the organic lesions of the Digestive Canal (§ 35, *et seq.*).—*A.* This lesion occurs, as a primary disease, frequently in infants and children, most commonly soon after weaning, or after a change of diet; but it may take place at any age from two months and upward, in children that have been improperly fed, or nursed by unhealthy females, especially in low, humid, close, and otherwise unwholesome localities. It supervenes also in the course of other infantile diseases, by which it is often masked, or which it may to some extent replace; and it is occasionally observed in the diseases of adults, but generally as a consequence or a contingency of their far advanced progress, as of tubercular consumption, &c. It is, in children, often a severe form of what has been commonly called the "*Weaning Brash*," or the "*Atrophia Ablactorum*," of Dr. Cheyne. This disease was first correctly described by M. Cruveilhier, and termed *gelatiniform softening of the coats of the stomach*; and by Dr. John Gairdner, of Edinburgh. About the same time, it was also noticed by Jaeger, Zeller, and others referred to in the *Bibliography*. The softening extends, more or less, to all the coats of the viscus, and is most frequently observed in the vicinity of the spleen. The coats may not only be softened, but they may even be so eroded as to give rise to *perforation* at one or more points. In most cases, however, it is very difficult to determine how far the softening and disorganization have existed during life, and how far they may have been a *post-mortem* change. I have met with many cases of this malady, both primary and secondary, at the Infirmary for Diseases of Children, under the circumstances just mentioned, and I believe that the softening often exists to a considerable degree previously to death; but the advanced stage of disorganization, and more especially erosion and perforation, are early consequences of dissolution, which the fluids of the stomach may have been, more or less, concerned in producing.

71. *B.* This disease is met with most frequently in children between the ages of four and eighteen months, owing to the causes just mentioned; and it appears to be more prevalent in July, August, September, and October, than in the other months of the year. From the localities which favour its development, and the seasons which influence its prevalence, this lesion may be said to be almost endemic in certain places, and epidemic in some seasons. It may appear in the course of infantile remittent fever, of hydrocephalus, or of chronic bronchitis; or it may follow the cholera infantum, or scarlet fever, or diarrhœa, especially after weaning, or when the infant has not enjoyed the advantage of a healthy nurse, or is being brought up by hand.

72. *B.* The *symptoms* of softening of the gastric tunics are, during the earlier stages, chiefly, loss of appetite, mucous or muco-bilious vomiting, and diarrhœa, the stools being liquid, green, or curdy, and offensive; excessive thirst, progressive debility, prostration, pallor, flaccidity and coolness of the skin; occasional flushes of heat, alternating with chilliness; somnolency or lethargy, attended by uneasiness; a disposition to doze, with the eyes half shut, and the pupils turned upward, &c. When the disease is more fully formed, the countenance expresses pain or uneasiness; the look is languishing or sorrowful; and the child whines frequently and is fretful. He is roused from his somnolency by the slightest touch, and if any one looks steadily at him, even from a distance, he cries, and changes his position. His faculties and senses are unimpaired, but he is peevish and distressed. The absorption of fat is excessive; the eyes are sunk in their sockets; the pupils are contractile, and there is no strabismus. Emaciation and flaccidity of muscles proceed rapidly; the lips and tongue become dry and cracked; and the vomiting of the food is frequent; the stools still continuing green, with shreds resembling spinach and slime: the urine is generally scanty. The pulse is at first slow, sometimes intermitting, but it becomes very quick and small towards the close. Flatulence and hiccough sometimes accompany the vomiting, and cough is not infrequent. The respiration is not materially affected until near the termination of the malady, when it becomes quick and laborious. The abdomen is rarely much swollen, although it generally is flatulent, and resonant on percussion. Ultimately, a pallid and shrunk countenance, red or inflamed eyelids, emaciated, flaccid, and cold extremities, a fluttering pulse, very quick breathing, restlessness, or somnolency, passing into insensibility, terminate life, generally in a very few days, and sometimes even in a few hours.

73. *B. On Dissection*, the appearances observed vary with the circumstances and associations of the disease—as it is primary or consecutive of some other malady—and with the period which has elapsed from dissolution. Although the changes cannot be altogether ascribed to dissolution, on the one hand, or to the action of the gastric juices on the other, they may be heightened by either, or even by both. That they exist, to a greater or less extent, in respect even of all the coats of the stomach, but especially the villous and cellular tissues, and that they amount to a

very manifest loss of the vital cohesion of these structures, I have been convinced by a careful observation of the phenomena preceding death, and by examination made as early as ten or twelve hours after death. The softening and dissolution produced by the gastric juices after death have been described under the article Digestive Canal (§ 41), and are chiefly observed in the most depending parts of the viscus. But the gelatiniform softening found after death in cases which have presented the above symptoms, either as a primary malady, or as an epi-phenomenon in the course, or at the close, of some other disease, has evidently commenced with the development of these symptoms, and has advanced until it was incompatible with the continuance of life. As it is generally the only or chief lesion found on dissection in the primary cases, and as it has been found in a very marked form even when the examination has been made a few hours after death, there is every reason to infer that it has commenced and existed previously, although it may have advanced farther after death had taken place. The situation of the softening, in some cases, precludes the opinion that it could have been produced by the action of the gastric juices; and if it have been thus caused, to what other lesion can the severe, rapid, and fatal symptoms characterizing the primary cases be imputed, seeing that none besides it can be detected either in the digestive organs or elsewhere, at least none sufficient to produce death! It should not be overlooked, also, that similar softening, although much less remarkable and extensive, is sometimes found, in these cases, in some portions of the duodenum or of the small intestines; and is to be referred to the same states of vital action, &c. (§ 74), as produce this lesion in the stomach.

74. Viewing, therefore, this alteration of the coats of the stomach as a primary, as well as a consecutive disease, the question arises as to the nature of the change—whether is it inflammatory, or is it the result of a vital impairment of the coats of the organ? or is it an association of both, a form of asthenic or cachectic inflammation? That it is not inflammatory is shown by the absence of vascular injection. That it proceeds chiefly from vital exhaustion, with impaired nutrition and cohesion of the tissues, may be inferred from the appearances after death; but it cannot be admitted that the whole amount of change is thus produced, as it may have been heightened immediately, or soon after death, especially when the change is most remarkable. This lesion, however, should be carefully distinguished from *solution of the coats of the stomach by the gastric juices after death.* This *post-mortem* change, which has been described when treating of the alteration found in the Digestive Canal (§ 35, *et seq.*), may occur after death from any cause, and in cases that have presented none of the symptoms attending the disease now being considered; but it may take place also in cases of this disease, and may either increase the softening previously existing, or even attack another portion of the parietes of the organ to which the gastric juices have gravitated.

75. *C.* The *Treatment* of the combination and procession of morbid phenomena constituting this disease, whatever may be the amount of organic change existing previously to death, or occurring subsequently, is the matter of chief importance. For cases frequently occur (and I have seen many of them, both in public and private practice) presenting all the symptoms of this disease, in greater or less severity, and proceeding with proportionate rapidity, for some of which treatment has been successful at an early period, others having gone on to a fatal issue, and manifested softening of the coats of the stomach, without either vascular injection or thickening, and often with diminished vascularity and unusual pallor of the tissues (*see* Digestive Canal, § 35, *et seq.*). When an opportunity is afforded the physician to treat the early stage of the disease, or even a more advanced state, more or less benefit will be derived from a healthy and young wet-nurse, the infant always sleeping in her arms. If, however, such a nurse cannot be obtained, or if the child cannot take the breast, ass-milk, warm from the animal, slightly diluted either with simple water or with lime-water, should be given at regular intervals; and various tonics, astringents, and antacids be exhibited in the intervals. The diet, consisting of various farinaceous articles, should be carefully attended to, taking care not to load the stomach, so as to favour the occurrence of fermentation or acidity. When the ass-milk is taken in sufficient quantity, but little more food is required, and sweets should always be avoided. The medicines which I have found most beneficial are cretaceous mixtures or powders, with small doses of cascarilla, cinnamon, and a very minute quantity either of creasote, or of tannin, or of capsicum. In some cases, especially when the urine has been ammoniacal, or contained much of the phosphates, I have prescribed small doses of the pyroligneous acid in an infusion of cascarilla or cinchona, or of the nitro-muriatic acids in the same or similar vehicles, or the muriated tincture of iron, with infusion or tincture of calumba. The great difficulty in these cases is to arrest the vomiting and diarrhœa; but this cannot be accomplished by sedatives, and narcotics are most injurious to young children. In some cases, however, especially in older children, the hydrocyanic acid may be given in suitable doses, with the sesqui-carbonate of ammonia, and with tonics and astringents. The irritability of stomach in this disease is more readily relieved by stimulants and tonics than by other means; and even the oleum terebinthinæ will often arrest this state when other means have failed. In most instances, also, aromatics should be given with cretaceous and alkaline medicines, and a terebinthinate embrocation may be applied to the epigastrium. If these means should confine the bowels, the risk of increased irritability of the stomach may be thereby incurred, and therefore suitable enemata ought to be administered, if the stools be insufficient or much disordered. In other respects the treatment should be directed, and the regimen conducted, as advised for Indigestion, and above for nervous or functional affections of the stomach (see § 14, *et seq.*). In every instance, the more remote causes of this malady, arising either from the locality or the circumstances of the case, ought to be carefully ascertained and removed, as far as possible, and change of air, especially to a temperate, pure, and dry air, should be advised, with the use of chalybeate medicines or waters, or such other means as are most likely to improve the vital cohesion and tone of the coats of the stomach.

76. When we have any reason to infer from the state of the stools, or other symptoms, that more

or less softening, or loss of vital tone, extends to the mucous surface of the intestines, the means now advised, aided by such others as have been recommended when discussing the treatment of *chronic* Diarrhœa (§ 29, *et seq.*), or of *asthenic* Dysentery (§ 88, *et seq.*), will often be found appropriate and successful.

77. iii. Scirrhous, Cancerous, or Malignant Lesions of the Stomach.—*Cancerous and Cancroid Growths*, Prof. Bennett. — *A. Carcinomatous and malignant formations of various kinds* are formed in the stomach, especially in or near the cardiac and pyloric orifices, and probably commence, especially the scirrhous and scirrho-carcinomatous kinds, as I have contended when describing them under the head Digestive Canal (§ 50, 51), in hypertrophy of the sub-villous cellular tissue. The scirrhous change either originates in, or is superinduced by, degeneration or modification of nutrition and secretion, consequent upon prolonged irritation, morbid diathesis, advancing age, and depressed vital power. The several kinds of malignant growths have been found in the coats of the stomach (see *arts.* Cancer, and Scirrhous and other Growths). The scirrhous forms are most frequent in the pyloric extremity of this viscus; while the medullary, the milt-like, the fungoid, the colloid, the hæmatoid, and other modifications of the encephaloid form of cancer, may commence in the cardiac orifice, or in any part of the gastric parietes.*

While scirrhous and scirrho-carcinomatous degeneration is generally of slow progress, and occurs in advanced age, the medullary, encephaloid, or fungo-hæmatoid (see *art.* Fungoid Disease), occurs at any age, but more especially in early age, is more generally developed in the form of distinct tumour, is more rapid in its progress, and often appears simultaneously or consecutively in different parts. *Perforation* of the stomach may occur as a termination of malignant disease, especially of the carcinomatous form of ulceration (see § 86, *et seq.*).*

* [In the *Anatomical Museum of the Boston Society for Medical Improvement* are many well-preserved specimens showing organic disease of the stomach.

No. 474 exhibits an ulcer in the body of the stomach, about an inch in diameter. The organ adhered to the spine at this part, and, on dissecting it up, the base of the ulcer was cut away. Subject, a female, 35 years of age.

No. 475, an ulcer of the stomach, near the pylorus, and about one third of an inch in diameter.

No. 476, two chronic ulcers at the pylorus, of a circular form, about half an inch in diameter, situated opposite each other, a large opening into the peritoneal cavity being seen in the base of one of them. Between the ulcers is something like a yielding of the parietes of the stomach, forming a shallow, ill-defined cavity, and which might be mistaken for the remains of another ulcer; and opposite to this, on the duodenal side of the pylorus, is the same appearance, only to a less extent. The pyloric portion of the stomach was somewhat rough, with slight follicular disease, and two small, ill-defined ulcerations. In the peritoneal cavity was found some recent lymph, besides the liquids and gas that had escaped from the stomach. The patient was a merchant, 63 years of age, who had been dyspeptic for a long while, but for the last one or two years much less so, if at all; not subject to vomiting. On the 3d of May, 1845, he complained at noon of a great sense of weight at the epigastrium; at 11 P.M. he sent for Dr. M. Wyman, of Cambridge, on account of pain in the abdomen, and this continued as a marked symptom, though it was by no means urgent, as is usual in these cases; the pulse was 72, afterward became more rapid, with symptoms of collapse, which continued till death on the following evening, at 10 o'clock.

No. 477, a specimen of *ulcers at the pylorus*, death from hæmorrhage. Patient, a middle-aged man, complained of pain in his stomach, diminished appetite, constipation, and general indisposition. Hæmatemesis succeeded the operation of a cathartic, and he sank speedily. The ulcer is of an oval form, an inch in length, and near the small curvature of the stomach, in the vicinity of the pylorus. The edges are not thickened and indurated, as is usual in these cases. In the base of the ulcer is seen the open orifice of a ruptured vessel. (1838.)

No. 478 is a specimen of *chronic ulcer of the stomach*, with perforation, and attended with hæmorrhage during life. The ulcer is one inch from the pylorus, in the small curvature, of an oval form, and measures two inches in length: the base, when recent, was of a dark, brownish colour, probably from the hæmorrhage, and in it is seen the perforation, about one third of an inch in diameter, and looking, as in similar cases, as if a piece had been *punched out*. The patient, a labouring man, aged 44, had been for many years very intemperate. For some months he had had pains in the region of the stomach after eating, and in the night had frequently vomited. Severe hæmorrhage, followed, after a few days, by acute pain, supervened, and he gradually sank into collapse. On dissection, a great quantity of liquid and solid food was found in the cavity of the abdomen, but there was no peritonitis.

No. 479, deep cancerous ulceration of the last two and a half inches of the œsophagus, with thickening and contraction; a scirrhous affection of the small curvature of the stomach, extending to the pylorus, from a man 72 years of age. About eight or ten months before death, he began to have difficulty in swallowing solid food, and soon had to abstain from it altogether; pain and a sense of oppression were felt beneath the lower end of the sternum after swallowing. Soon after, he began to vomit his food, with much distress, and these symptoms continued, though when the stomach was empty he was sufficiently comfortable. Patient of Dr. John Homans.

No. 480, scirrhous disease involving the pyloric portion of the stomach, small curvature, and altogether one half or more of the entire organ, ulceration having commenced near the pylorus. The muscular coat in the healthy portion was not hypertrophied, as described by M. Louis. The whole organ was much contracted in size, and seemed to be drawn into the left hypochondrium, the tumour, which was felt during life, being quite to the left of the median line, and sometimes fairly beneath the cartilages of the ribs. The omentum was also scirrhous. A small scirrhous mass was also found in the liver, where it adhered to the stomach. From a gentleman 36 years of age. About three years before his death, he began to spit up his food, without nausea, the taste being scarcely altered. This came on, not at any stated time after eating, but whenever he began to move about, and the quantity thus thrown off was sometimes very great. This attack lasted three or four weeks, and he afterward had a second, his health during the interval being quite good. The principal symptoms for five months preceding death were, spitting up his food, an inordinate appetite, obstinate constipation, and great emaciation; he had an uncomfortable feeling at the epigastrium, but could bear no pressure there. The tumour was first felt six weeks before death.

No. 481, a case of scirrhous stomach, from A. L. Pierson, of Salem. The disease is in the body of the organ, about midway. The entire circumference is affected, and the contraction such as hardly to allow the passage of the finger, the stomach appearing as if tied round by a band. In the large curvature is a superficial ulcer an inch in diameter. The patient was Dr. Holyoke, of Salem, aged 100 years and 8 months. About four months before his death, he met with an accident, from which time his health gradually declined, and he suffered from pain in the epigastrium, depression of spirits, and other symptoms of disease.—(See Memoir of Dr. Holyoke, by Dr. Pierson.)

No. 482, a specimen exhibiting extensive and deep cancerous ulceration in the pyloric portion of the stomach. In the midst of this mass of disease, a strip of healthy parietes remains, guarded on each side by a broad, prominent, cauliflower-looking excrescence. An aged woman, who died in the alms-house.

No. 483, scirrhus of the pyloric portion of the stomach; also, much disease in the cellular membrane, and in the omentum connecting the stomach with the arch of the colon, the intestine at one part so contracted as not to allow the passage of the little finger. There was extensive ascites, and a peculiar, perhaps malignant, disease of the ovaries. Patient, a female 41 years of age, had been two years in the Massachusetts General Hospital, with dyspepsia and hepatic symptoms. About a month before death, there came on a vomiting and spitting up of food and dark-brown matter, with eructation, and much distress at the stomach. Described by J. B. S. Jackson, M.D., Curator of the Museum.]

* [Scirrhous tumours of the pylorus are extremely frequent in some parts of the United States, as in Maine and other parts of New England. One practitioner of great eminence in that state (Dr. James M'Keen), informs us that he has seen in his own practice, or in consultation, nearly two hundred cases of this affection. Making allowance for the absence of precise statistics, it is very cer-

78. *B.* The *symptoms* of malignant disease of the stomach are often very equivocal during the early progress of its several varieties, and it is often not until the lesion is far advanced that they can be relied upon. The chief symptoms are, 1st. Pain at the epigastrium or its vicinity; 2d. Indigestion, loss of appetite, flatulence, acrid eructations, nausea, and vomiting; 3d. The presence of a tumour in or near the gastric region; and, 4th. Emaciation and a cachectic or yellowish anæmic hue of the surface, and various other constitutional phenomena.

79. (*a*) The *pain* at the epigastrium is generally gnawing or burning, sometimes lancinating. Occasionally, and at first, it is not much complained of, unless pressure is made on the stomach; and often the slightest pressure cannot even then be long endured, although no acute pain is thereby produced. The pain may be increased either by an empty or by a full state of the viscus. Sometimes the pain recurs at intervals, and becomes remarkably severe. In many cases it extends to the hypochondria, or to the back, or along the œsophagus. In others, especially the cancerous or carcinomatous, a lancinating pain is present at an early period, and is among the first symptoms to announce the nature of the malady. In the fungoid or encephaloid disease, pain is often slight or almost wanting.

80. (*b*) The *symptoms of indigestion*, as anorexia, nausea, vomiting, &c., are often among the earliest; but they cannot be relied upon, as they may be absent to the very close of the malady. MM. Chardel, Cruveilhier, Andral, and Ferrus state that they have met with cases in which no more severe symptoms than those of slight indigestion had been present up to the period of dissolution. Such instances are very rare; but I have seen cases in which vomiting had not occurred until very shortly before death, the matters vomited having been then very dark and grumous, or sanious, from the exudation of blood from the diseased part. The vomitings which accompany malignant disease of the stomach have been ascribed to obstruction of the orifices of the viscus. They doubtless very often are dependent upon this cause, but they often also occur where these orifices are free, or where the lesion is seated in other parts of the parietes. When vomitings are not frequent or are absent, it may be presumed that the pyloric orifice is free. When, however, vomitings occur some time after the ingestion of food, with marked frequency or constancy, and nearly after the same interval, then disease of this orifice may be suspected.

81. When the ingesta are returned immediately after having been swallowed; when deglutition is followed by a sensation of obstruction under the lower part of the sternum, or by a feeling that the food does not pass into the stomach; when the aliments are ejected instantly without change, and mixed with some glairy mucus; or when there is much nausea, without much evacuation by the mouth, excepting glairy matters; then it may be inferred that the disease is seated in the cardiac orifice of the stomach. In these cases the pain is more limited to the epigastrium and beneath the sternum, often extending to the back.

82. The characters of the vomited matters vary with the seat, nature, and progress of the malady. When the pylorus is the seat of lesion, the matters thrown off may be more or less digested, but at a far advanced period, or shortly before death, the ejected matters contain altered blood, and present numerous brown or black minute flakes, ultimately passing into the appearance of coffee-grounds, or nearly resembling the black vomit of pestilential fever. In the fungoid or encephaloid form blood is often poured out in larger quantity, and occurs in a purer form or less altered in the ejected matters, thus closely resembling the hæmatemesis of simple ulceration of the stomach, from which, however, it is generally distinguished by the existence of tumours in the gastric region, in this malignant form of lesion.

83. (*c*) The presence of *tumour* in or near the epigastrium is an important symptom of malignant disease of the stomach. When scirrhous induration or other form of malignant tumour exists in the pylorus, then it may not be detected at the epigastrium; but, owing to its density or size, and to the extreme distention of the viscus, it may have descended much lower, or even somewhat to either side, according to the position of the patient. Malignant disease may, however, exist in any portion of the parietes of the organ without occasioning much tumour, and even when it does to a moderate extent, it may not be detected, unless when the patient is very much emaciated, which is not always the case; and when it is detected, it is often difficult to distinguish it from tumour of the pancreas, or of the liver, or spleen, or of the omentum.

84. (*d*) The *cachectic* and anæmied character of the countenance and general surface, and the peculiar earthy *odour* sometimes exhaled from the body, are observed chiefly at an advanced stage of malignant disease, and are to be attributed chiefly to the constitutional taint, and to the alteration and deficiency of the blood, these changes not being always attended by emaciation, although they are more frequently thus attended. This appearance, however, very generally accompanies malignant lesions of other organs; and it is, therefore, from the association of it with the other symptoms already noticed that the seat of the present malady can be inferred.

85. (*e*) *During the progress* of the malady the symptoms often vary much: certain of them become more severe, others are alleviated, and the severity of the disease is for a period somewhat abated. But after an uncertain period, and after some error in diet and regimen, or after mental emotion, the symptoms recur with increased severity, or even additional phenomena are observed, especially aggravated pain, vomitings, eructations, borborygmi, hiccough, constipation of the bowels, colicky pains, &c. When the disease is seated in the pylorus, its progress is not merely slow, but the character of the vomiting is generally different. Food may not be thrown off the stomach during the early course of the malady, or not until the orifice becomes much contracted or obstructed, or near the close of life; and generally vomiting does not occur until a considerable period after food has been taken. Very frequently, also, articles which have been taken several or many hours previously are thrown up

tainly a frequent form of gastric disease in that region of country, as we have had abundant occasion to observe. We are inclined to attribute its great frequency to crude and indigestible articles of food, and the constant irritations thus set up, resulting in organic disease.]

more or less digested, while those which have recently been taken are retained. This, very probably, is owing to the circumstance of the latter being directed to the fundus of the viscus, while the former, having been digested, and having reached the diseased pylorus, are thrown backward and upward to the cardia.

86. (*f*) The *duration* and progress of the malady depend much upon the seat and nature of the lesion. If it be seated in or near the cardia, and if it be the encephaloid or fungoid variety, the duration is much shorter than when it is of a scirrhous or scirrho-carcinomatous nature, and is seated in or near the pylorus. In the former, also, the pain is less acute, and the hæmorrhage is earlier and more distinct than in the latter. Cancerous ulceration may supervene in either variety of malignant disease, and may go on to *perforation*; but in these, neither is lymph thrown out, nor are adhesions formed, so as to prevent a communication with the peritoneal cavity. Perforation, however, seldom occurs, death generally taking place before the carcinomatous ulceration has proceeded so far. During the progress of the malady, costiveness, or even constipation, is a most troublesome symptom; but occasionally, when the pylorus is not obstructed, or when its valve is destroyed by ulceration, a portion of the sanious discharge from the ulcerated parts passes into the intestines and occasions colicky pains, diarrhœa, or dysenteric stools, and accelerates the fatal issue. When perforation of the parietes of the stomach is produced, violent peritoneal symptoms are immediately occasioned, and soon terminate life.

87. The duration of the malady can rarely be ascertained with precision; for dyspeptic symptoms, of greater or less severity, and more or less numerous, always precede the manifest development of malignant diseases, which even may not be distinctly declared until shortly before death. The antecedent dyspeptic symptoms are generally thus present for years before the nature of the disease can be ascertained, and when ascertained death may ensue in a few weeks or even days. The duration of the malady is, however, rarely less than several months, and is generally as long as several years. When it is seated in the cardiac orifice, and nearly obliterates the passage into the stomach, the duration is much shorter, and the sufferings of the patient most distressing, and the emaciation greater; but several months, or even years, may elapse before the lesion has advanced so far as to amount to this extreme pitch.

88. *C.* The *Diagnosis* of cancer of the stomach is sometimes very difficult; for when there is no tumour detected it may be mistaken for chronic gastritis, or for simple ulceration of the stomach; and when there is tumour, the pancreas, liver, or spleen may be its seat. For either instance it is impossible to assign infallible diagnostic signs. The history of the case, the association and procession of the symptoms, the nature of the causes and antecedents, the *juvantia* and *lædentia*, and the constitutional symptoms, in either state of disease, will chiefly guide the attentive observer. Generally, the discharge of blood from the stomach is much greater in simple ulcerations than even in the hæmato-fungoid variety of malignant disease. In the great majority of cases, also, no blood is found until a far advanced stage, or until shortly before death, and then the blood presents the coffee-ground or minute flaky appearances already noticed, occasioned by its minute quantity and altered character. If considerable hæmorrhage occur in the advanced stage of fungo-hæmatoid cancer, or of other varieties, there is generally more or less tumour or hardness, which may often be detected upon a careful examination. But it must be admitted that hæmatemesis may and does often accompany tumour of the spleen, liver, and pancreas, more especially the spleen and liver. The various circumstances and peculiarities of the case, of its progress, and of its concomitants, will be duly considered by, and will guide, the cautious and observing physician.

89. *D.* The *Causes* of malignant disease of the stomach are chiefly those which I have fully stated when treating of Cancer (§ 23, *et seq.*) and Fungoid Disease (§ 16, *et seq.*). To these places I refer the reader; but I may very briefly notice at this place the causes which act more especially on the stomach. Cancer of this viscus is much more frequent in males than in females, probably owing to intemperance, and to depressing emotions of the mind, being more frequently and more permanently experienced by the male sex. Scirrhous or scirrho-carcinomatous forms of malignant disease of the stomach are seldom observed before middle age, and are most frequent in the advanced epochs of life. Hereditary predisposition, or constitutional taint, derived from a parent, has evidently a considerable influence in favouring the occurrence of the malady when other causes concur to develop it. This predisposition was remarkable in the case of the great Napoleon. In what this diathesis consists is not clearly shown; but the temperaments in which it has been supposed most frequently to occur are the nervous and lymphatic, or those mixed with the sanguine or bilious. The ranks of life in which it is most frequently observed are the middle and higher ranks, owing probably to their greater liability to anxieties of mind, and the depressing mental emotions, which, with inanition, protracted abstinence, excessive application to study, business, &c., are the most influential causes of the malady. Protracted functional disorders of the stomach, the air and water of certain localities, the abuse of spirituous liquors, frequent or constant pressure on the gastric region, and the other causes mentioned when treating of Cancer, frequently aid profound or prolonged chagrin and anxieties of the mind. Various trades, professions, and occupations have been said to favour the occurrence of the malady, but with insufficient reason, or in no very appreciable degree. (See *arts.* Cancer and Fungoid Disease.)

90. *E.* Treatment.—During the commencement of cancerous affections of the stomach, there is seldom sufficient evidence of the nature of the disease to induce the physician to employ means for its arrest; and even when its nature is suspected, or correctly inferred, there is no known remedy which is capable of producing this effect. At this period, when the symptoms are chiefly those of chronic indigestion, or of chronic gastritis, the means which have been found most beneficial for these diseases, and such diet and regimen as the patient experiences the most benefit from, are also most serviceable in cancerous affections of the stomach. Even if these affections were recognised at this early period, there would

be very great difficulty in devising more suitable means than those usually found most serviceable in functional disorders of the organ. If the malady be inferred to exist at this early period, or if it have more manifestly declared itself at an advanced stage, all that can be expected from treatment is, 1st, to alleviate the more distressing symptoms; and, 2d, to retard the progress of the malady; and these ends may generally be partially attained.

91. It has been very justly remarked by M. Gibert, and adopted by Dr. Houghton, that "our predecessors, who were less acquainted than we with the fatal progress of organic lesions, succeeded, perhaps, oftener than we do in palliating the symptoms and prolonging the lives of patients, by applying themselves incessantly to oppose the most obvious symptoms. Their attention was not entirely preoccupied, like that of the anatomist-physicians of the present day, with the incurability of the local lesion which is the source of the disease." But while the fulfilment of the intentions proposed to ourselves, when treating this malady, should be kept in view, the predisposing and exciting causes, mentioned above, and under the article Cancer, ought to be removed or counteracted by treatment, medical and regimenal, as far as may be possible. Whenever obstinate or prolonged dyspepsia, or symptoms of chronic gastritis, occur in an individual whose parent or grandparent died of this malady, then suspicions of incipient cancer of the stomach should be entertained, and the treatment ought to be directed accordingly. If these suspicions should not be confirmed, the means advisable for the more dangerous malady would not be inappropriate for the more slight; indeed they will generally prove the most rapidly beneficial.

92. There are few causes which more injuriously affect the digestive and assimilating functions than the depressing mental emotions and anxiety, and therefore these should be avoided by relinquishing avocations which involve such emotions. The greatest care ought also to be exercised in the choice of food. The patient should be guided in this by his sensations and experience; but generally the farinaceous articles of food, taken in moderate quantities, and not after too long intervals, yet in sufficient quantity to duly nourish the frame and support organic nervous power, will be found the most suitable. These may be taken in or with animal broths or soups, in small quantities, or with jellies, &c. I have often recommended new-laid eggs, merely warm, and asses' milk, warm from the animal, with a small portion of lime-water, with much benefit. The great object in the treatment of inferred cases of malignant disease of the stomach is to furnish bland and unirritating nourishment in sufficient quantity, without exciting or distending the organ. But while these and other articles of diet are allowed, with such others as are mentioned when treating of Indigestion (§ 42, 55, *et seq.*), or are found by the patient to agree with him, the more painful symptoms should be allayed by suitable narcotics, or by hydrocyanic acid, prescribed in conjunction with emollients, demulcents, or mild bitter tonics. I have met with cases of inferred internal cancer, for which I have prescribed a vegetable and farinaceous diet, distilled water for all the purposes for which water is required, as advised by Dr. Lambe, and residence in a dry and mild air, and very great benefit has been derived from the treatment.

93. As to the use of the several narcotics, but little can be added to what has been stated under the head Cancer (§ 30, *et seq.*). I have preferred the more common preparations of opium to either the acetate or muriate of morphia, in malignant disease of the stomach, the latter frequently proving injuriously depressing without affording any countervailing advantage. The combination of narcotics, as of conium with henbane or poppy, or of opium with hop, or the infusion of hop with henbane or hydrocyanic acid, has often been serviceable. As the disease advances, the necessity of having recourse to palliative means increases, and the doses of these require also to be augmented. But it will be found that these remedies, however great the dose, frequently fail in preventing or arresting the vomiting in the advanced stages of the malady, if solely relied upon. They should, therefore, be conjoined with such stimulants and aromatics as may be found most serviceable in such circumstances, as creasote, musk, sumbul, &c. I have very rarely observed much benefit to accrue, beyond a very temporary relief, from aconite, belladonna, or stramonium. Nevertheless they may be tried in similar combinations to those just now mentioned. If acidity or flatulence of the stomach be much complained of, ammonia, magnesia, or other antacids may be given with narcotics and aromatics; or lime-water may be taken with boiled milk, or with asses' milk. The iodide of potash, in small doses, may also be tried in conjunction with the carbonate of potash, or the solution of potash, or Brandish's alkaline solution, and with narcotics and aromatics; but I have seldom seen any benefit derived from it in malignant disease of the stomach. If hæmorrhage from the stomach be indicated by black or pitchy stools, or if hæmatemesis occur, the spirits of turpentine may be prescribed in such forms or combinations as have been recommended above (§ 59, 69, 75), or where Hæmorrhages of these kinds are considered.

94. The constipation attending malignant diseases of the stomach often proves a great source of trouble or distress to the patient, and a great difficulty to the physician. Enemata should be daily employed; but, however active the substances which may be administered in these, they often fail of producing satisfactory results. Calomel is often too depressing, as respects the vitality of the stomach, especially when repeated, and irritating or drastic purgatives ought to be avoided. The preparations of senna or of rhubarb may be conjoined with vegetable tonics, with magnesia, or with manna, or phosphate of soda, citrate of magnesia, &c., or with such other aperients as may be found to be retained by the stomach.

95. The thirst, heat at stomach, nausea, and vomitings, which are often so distressing in the course or near the termination of the malady, can seldom be altogether allayed, although they may be sometimes partially relieved, by exhibiting effervescing beverages with bland nutrients, or mild stimulants, as Seltzer-water with milk, and a small quantity of weak wine, as hock, Barsac, &c.; or soda-water, or effervescing lime-water, with the same articles; or spruce-beer, or small quantities of weak tar-water, with milk, &c.; and by making these the vehicles in which the medicines most appropriate to the case may be given. The retchings and vomitings are sometimes relieved by combining creasote with opium and cre-

taceous powders or mixtures; and epithems, with the vinum opii, or with one or other of the warm embrocations prescribed above (§ 59), to which the opiate is added, may be applied over the epigastrium. If diarrhœa, or extreme vital depression, or spasms, supervene, these means, aided by the more powerful stimulants, absorbents, and astringents, may be administered; but no farther advantage than a temporary relief can be expected from them.

96. iv. Other Organic Lesions of the Stomach are occasionally observed, but they can rarely be distinguished during life; and, when met with upon dissection, the only particulars which can generally be obtained as to their origin and the symptoms attending them, are such as usually accompany chronic gastritis, or scirrhous or malignant diseases of the organ. These lesions have been fully described in the article Digestive Canal (§ 27, *et seq.*), and to that I beg to refer the reader.—*A.* Those alterations which are most frequently observed are generally consequent upon prolonged irritation, and upon excesses in eating and drinking, and consist chiefly of *hypertrophy of the villous and muscular coats and of the connecting cellular tissue*, existing either singly or in combination. They may not be attended by any serious symptom, and be detected only after death from some other disease. When, however, they are seated in either the cardiac or pyloric orifice of the organ, and are attended by much thickening of the part, they occasion more or less disorder, according to the amount of obstruction they produce; and in such circumstances they may be mistaken for, although different from, malignant disease of the viscus. It is very rarely that very serious symptoms are occasioned by these alterations, unless ulceration supervene in some part of the thickened or hypertrophied structure; and in such cases, it is very difficult to determine whether or no the alteration be truly scirrhous, which it most probably often is, if the hypertrophy or thickening be chiefly seated in the sub-mucous cellular tissue.

97. In these cases, whether they result merely from prolonged irritation, excitement, or inflammatory action, or whether they be incipient cancer, the *treatment* should not be materially different from that which has been advised for other diseases of the stomach, namely, to improve the general health, to promote the constitutional powers, and to remove or to relieve the symptoms which are either most important or most urgent. With these intentions, change of air, travelling, the use of mineral springs, or waters suited to the symptoms most complained of, and attention to diet and regimen, should be recommended.

98. *B. Alterations of the capacity of the stomach* are sometimes observed (see Digestive Canal, § 52, *et seq.*).—*a. Increased capacity* is generally a consequence of more or less obstruction at the pyloric orifice or its vicinity. In cases of scirrhous or cancerous pylorus, the stomach is often remarkably increased in capacity; and when the pylorus or upper portion of the duodenum is constricted from other alterations, increased capacity of the viscus is also generally observed. In a case in which inflammation of the concave surface of the liver extended to the pylorus and head of the duodenum, and was followed by false membranes and adhesions of these parts, the subsequent organization and contraction of the morbid productions had so completely constricted the pylorus, as to prevent the passage of a quill through it; the patient having died under my care with symptoms which were referred to scirrhous pylorus, and with enormous dilatation of the stomach. In some cases, the increase of capacity is attended by hypertrophy of the muscular and villous coats; but this is observed only in some of the more chronic cases of scirrhus of this orifice. In others, the increased capacity is attended by remarkable thinness of the coats. Greatly enlarged capacity of the organ, with hypertrophy of the coats, has been observed in some cases in which habitual gluttony had existed during life. In such instances, increased function or action had developed the growth of the structures and the size of the organ.

99. *b. Diminished capacity* of the stomach is also sometimes seen (see Digestive Canal, § 53), but most frequently in consequence of inanition, or in connexion with hypertrophy of the coats, or with scirrhous or other malignant diseases of the organ. It may be occasioned also, although very rarely, by the cicatrization of ulcers, or by the contraction of false membranes, or of organizable lymph thrown out upon the serous surface of the organ. Extreme diminution of capacity is caused by the passage of acrid, corrosive, or astringent poisons into the stomach, especially the mineral acids, and is then not infrequently attended by abrasions of the villous coat. Kiernander observed it after poisoning by nux vomica.

100. *C. Attenuation of the gastric tissues* is not often observed without any other change. It is most frequently seen in cases of obstruction of the pylorus, and then is often associated with increased capacity, especially at or near the fundus of the organ. But it is met with, also, without any increase of size. Several other alterations of structure have been found in the stomach, namely, *anomalous fibrous and fibro-cartilaginous formations, tubercular ulcerations, fatty or lipomatous tumours in the connecting cellular tissue, fistulous openings through the coats of the stomach and parietes of the abdomen, or some other part of the digestive canal, and various displacements of the organ*, &c. But these are of very rare occurrence, and seldom admit of diagnosis or of relief during life. (See *arts.* Digestive Canal, Cancer, Disease, &c.)

101. *D. Rupture* or *laceration* of the coats of the stomach has been observed after vomiting or retchings in the course of disease or of ulceration, especially when the coats have been attenuated or softened in parts, or where ulceration has penetrated the muscular coats, and nearly or altogether reached the peritoneal surface. The same result has followed from distention of the viscus by ingesta, or more probably from the reaction of the parietes upon the distention. Rupture of the stomach is not infrequent after falls, or violent blows on the region of the stomach, especially when distended by a full meal.

102. *E. Wounds* penetrating the walls of the organ are generally fatal; but in some instances recovery has taken place from them, either with or without a fistulous opening in the abdominal parietes. While lacerations are always fatal, wounds may fail of proving fatal, the coats contracting, so as to prevent the passage of the contents of the viscus into the peritoneal cavity, and closing up and ultimately cicatrizing; or if continuing open or fistulous, the lymph exuded

around the wounded peritoneal surfaces agglutinating them, and preventing the consequences observed in other circumstances.

103. *F. Numerous foreign bodies*, which have been swallowed, may be retained for prolonged periods in the stomach, and produce various effects, according to their natures or their chemical or mechanical properties or conditions. They may irritate, inflame, ulcerate, or even perforate the viscus. The irritation may be soon followed by their rejection. Even blood, effused from ulcerated parts, or diseased vessels, of the organ, or that which has passed into it from the nares, fauces, or pharynx, when present in considerable quantity, will be thrown off; but when it is present only in small quantity, it will pass the pylorus into the intestines, and give the stools the characters of melæna. Cases on record are numerous in which foreign bodies have been retained for weeks and even months in the stomach, and either have been afterward thrown up, or found there on dissection, or have caused ulceration and perforation, not only of the stomach, but sometimes also of the adjoining viscera or parts.

Bibliog. and Refer.—*Celsus*, l. iv., cap. 12.—*Galenus*, De Loc. Affect., l. v., cap. 6; et Method. Med., l. vii.—*Aëtius*, Tetrab., l. iii., 93; l. iv., 81.—*Alexander Trallianus*, l. iii., c. 9.—*Paulus Ægineta*, l. iii., c. 37.—*Avicenna*, Canon., l. iii., fen. 13, tract. iv., cap. 1.—*A. Fumanellus*, De Ventriculi Affectibus præter naturam, Opera, p. 512.—*J. Heurn*, De Morb. Ventr. Opera. Lugd. Bat., 1608.—*J. Vandæus*, De Morb. Ventriculi, l. iii.—*J. Verandæus*, De Morbis Ventriculi, l. iii., 8vo. Monsp., 1619; in *Haller's* Bibl. Med. Pract., t. ii., p. 386.—*Zacutus Lusitanus*, Prax. Admir., l. ii., 68; l. iii., 25.—*Glisson*, De Ventriculo et Intestinis, tr. ii., cap. 22.—*B. Swalwe*, Ventriculi Querelæ et Opprobria, 12mo. Amst., 1664.—*Diemerbroeck*, Anat., l. i., c. 7.—*Waldschmidt*, De Ventric. et Intest. Morbis. Marb., 1684.—*Bonet*, Sepulchretum, l. ii., sect. vii.—*Huxham*, in Philosoph. Transac., No. 382; et Opera, vol. iii., p. 9. (*Displacement from a tumour in the omentum.*)—*Haasius*, De Tunicæ Villosæ Renovatione, 8vo. Altenb., 1735.—*F. Hoffmann*, De Inflammatione Ventriculi frequentissima. Opera, t. vi., p. 223, 227. (*Gastritis produced by violent anger.*)—*G. A. Langguth*, De Tabe ex Pylori Angustia, 1750, in *Haller's* Diss. ad Med. Pract., vol. iii.—*Haller*, Morbi aliqui Ventriculi in Cadav. observati. Gœt., 1749.—*Lieutaud*, Hist. Anatom Med., t. i., obs. 74, 139, 141. (*Perforations and external fistulæ.*)—*B. J. Dacker*, Essai sur l'Influence de 'Estomac en toutes les Opérations de l'Œconomie Animale, 12mo. Amst., 1763.—*Burrows*, in Medical Facts and Observat., vol. v., No. 17.—*J. Bleuland*, De Difficili aut Impediti Alimentorum ex Ventriculo in Duodenum, &c., 4to. Lugd., 1787.—*Whytt*, Works, 4to, p. 577. Edinb., 1768. (*Two cases of ulceration and perforation of stomach.*)—*Vetter*, Aphorismen, t. i., p. 172.—*Levelling*, De Pyloro Carcinomatoso. Inq., 1777.—*A. Portal*, in Mémoires de l'Académie des Sciences. Ann. 1771.—*M. Stoll*, Rat. Med., t. i., p. 252.—*J. Hunter*, Philosoph. Transact., vol. lxii., p. 444; and Observ. on Animal Economy, p. 226. (*Digest. of coats by their juices.*)—*Bang*, in Acta Reg. Soc. Med. Haun., vol. i., p. 243 (*Central contraction as if bifid*); et Diarium, t. ii., p. 367.—*Ranoe*, in Act. Reg. Soc. Med. Haun., vol. iii., p. 247.—*Bang*, in Ibid., vol. ii., p. 80 et p. 279. (*Gastritis caused by violent mental emotions.*)—*Delaroche*, in Bullet. de la Soc. de Méd., p. 224. App. ad Journ. de Méd. Contin., t. xi. (*Contracted in the middle.*)—*Hallè*, in Hist. de la Soc. Roy. de Méd. 1780. (*Thickening of the coats.*)—*Anderson*, in Edin. Med. Commentaries, vol. ii., p. 301.—*Thilenius*, Medic. und Chirurg. Bemerkungen, t. i., p. 202. (*Thickening of the coats of stom. after gout.*)—*Sandifort*, Observat. Anat. Pathol., l. iii., cap. 3; l. iv., p. 27, 45. (*The stom. contracted in the middle, so as to form a double organ.*)—*Morgagni*, De Sed. et Caus. Morborum, ep. viii., 25; xvi., 4; xvii., 10; xxi., 24, 36, 44; xxix., 8; xxx., 2; xxxix., 15. (*Great distention or enlargement of.*)—*Stoerck*, Annus Medicus, i., p. 113. (*Great distention of.*)—*Saillant*, in Mém. de la Soc. Roy. de Méd., t. viii., p. 105. (*The frequency of gastritis in children.*)—*Nebel*, De Ulcer. in Ventricul. Penetrat., &c. Heidl., 1782.—*J. N. Petzold*, Vom Verengerung und Verhärtung des untern Magenmundes, 8vo. Dresd., 1787.—*C. G. Boekme*, Anleitung die vorzüglichsten Krankheiten der ersten Wege zu heilen, 8vo. Leips., 1788.—*G. F. Hildebrandt*, Geschichte der Unreinigkeiten im Magen und in den Gedärmen, 8vo. Braunsch., 1789.—*Walshman*, in Mem. of the Med. Society of London, vol. v., p. 182. (*Complicated with erysipelas in children.*)—*Fearon*, in Ibid., vol. ii., art. 38.—*Daubenton*, in Mém. de la Soc. Méd. d'Emulation, t. ii., p. 179.—*C. Webster*, Facts tending to show the Connexion of the Stomach with Life, Disease, and Recovery, 8vo. Edin., 1793.—*M. Baillie*, Series of Engravings, &c., fasc. iii., fig. 6, 7; and Morbid Anatomy, &c., p. 76.—*Ferro*, in Med. Archiv. von Wien. 1800, 1801.—*A. Portal*, Cours d'Anat. Médec., t. v., p. 78, 180.—*Leroux*, in Journ. de Médecine Continué, t. xv., p. 239. (*Perforation passing into the spleen.*)—*A. Pujol*, Œuvres de Méd., t. i.—*Wiesner*, De Spasmo Ventriculi. Vit., 1802.—*J. Helm*, Zwey Krankengeschichten, ein Weib mit einem Loche in dem Magen, &c., 8vo. Wien, 1803.—*A. Gerard*, Des Perforations spontanées de l'Estomac, 8vo. Paris, 1803. (*Adduces a variety of cases.*)—*A. D. Stone*, A Pract. Treatise on the Diseases of the Stomach, &c., 8vo. London, 1806.—*Drake*, in Edin. Med. and Surg. Journ., vol. ii., p. 417. (*Great contraction and thickening of walls.*)—*P. A. Prost*, La Médecine Eclairée, &c., 2 vols., 8vo. Paris, 1804.—*J. C. Speer*, General Views relating to the Stomach, 8vo. London, 1818.—*J. Elliotson*, Cases illustrative of the Efficacy of Hydrocyanic Acid in Affections of the Stomach, 8vo. London, 1820.—*Cullen*, Works, edited by *Thomson*, vol. ii., p. 465.—*Chardel*, Monographie des Dégénérations Skirrheuses de l'Estomac, 8vo. Paris, 1806.—*J. P. Frank*, De Curand. Homin. Morbis, l. v., par. ii., p. 391 (*Enormous distention of*), l. vi., pars i., p. 60; et Acta Inst. Clin. Vilp., ann. ii., p. 72.—*G. Rees*, Pract. Observat. on Disorders of the Stomach, 8vo. Lond., 1810.—*Jaeger*, in Hufeland u. Himly Journ. der Pract. Heilk., p. i, 22. May, 1811.—*Ratheau*, Essai sur les Affections Organiques de l'Estomac, 8vo. Paris, 1812.—*Burns*, in Edin. Med. and Surg. Journal, vol. vi., p. 129. (*Perforation by gastric juices.*)—*Heim*, in Horn. Archiv., p. 12. Jan., 1812. (*Spontan. perforation of stom. during life.*)—*E. Barlow*, in Edin. Med. and Surg. Journ., vol. x., p. 435.—*Marcus*, Ephemeriden der Heilkunde, b. i., 2 heft.—*Caldani*, in Memorie di Fisica della Soc. Stat. à Modena, t. xii., p. 2. (*Ulceration and adhesion to the pancreas.*)—*Zeller*, De Natura Morbi Ventric. Infant. Perforantis, 1818.—*G. Lasnè*, Considérations Médico-Légales sur les Erosions et Perforations Spontanées de l'Estomac, 8vo. Paris, 1819.—*Pemberton*, Pract. Treatise on various Diseases of the Abdominal Viscera, 4th ed., p. 128. 1820.—*Meckel*, Tab. Anat. Patholog., fasc. iii., tab. 20.—*R. Dunglison*, Commentaries on Diseases of the Stomach and Bowels of Children, 8vo. Lond., 1824.—*T. Hare*, A View of the Structure, Functions, and Disorders of the Stomach, 8vo. Lond., 1823.—*Chaussier*, Nouv. Journ. de Médecine, t. iv., p. 295. (*Perforation of the walls of.*)—*Thompson*, Annals of Medicine, vol. i., p. 417.—*Rullier*, in Archives Génér. de Méd., t. ii., p. 380. (*Cancerous perforation of stom.*)—*Louis*, in Ibid., vol. iv., p. 536 (*Cancerous pylorus and hypertrophy of the muscular coat throughout*); and in Ibid., t. v., p. 5.—*Ebermaier*, in Ibid., t. xviii., p. 427. (*Ulcerative perforation.*)—*Hédiard*, in Journ. des Progrès des Sciences Médicales, t. xvi., p. 250. (*Destruction of muscular coat and vomiting till death.*)—*Laennec*, in Revue Médicale, t. i., p. 379, 1824. (*Cancerous perforation of stomach.*)—*Bourdon*, in Ibid., tom. ii., p. 209. 1825.—*Cannet*, in Ibid., t. iv., p. 527. 1825. (*Perforation of stomach.*)—*Crampton*, Trans. of College of Phys. of Ireland, vol. i., p. 1. (*Ulceration and rupture of stom.*)—*Pickels*, in Ibid., vol. iv., p. 189, 441; and vol. v., p. 171. (*Discharge of insects from the?*)—*Cheyne*, Dublin Hospital Reports, vol. iv., p. 252.—*Blaud*, Nouv. Biblioth. Méd., t. ii., p. 5, 1826. (*Foreign bodies lodged in the stom.*)—*Sestie*, in Journ. Hebdomad. de Méd., t. i., p. 216.—*Blasius*, in Ibid., t. iii., p. 69. (*Gelatiniform softening of stom. in children.*)—*Schmidtmann*, Observat. Med., t. iii., p. 288, 451.—*Jaeger*, in Lond. Med. Repository, vol. x., p. 426. (*Softening and erosion of coats.*)—Journ. Complémentaire des Sciences Méd., t. xxxvii., p. 189.—*Lobstein*, Anatom. Pathologique, t. i., p. 557.—*Broussais*, Histoire des Phlegmasies Chroniques, t. ii., ch. i.—*Guersent*, Dict. des Sciences Méd., t. xvii., art. *Gastrite.*—*Dieffenbach*, Dégénération Cartilagineuse de l'Estomac, in *Rust's* Magazin, t. xxvi.—*J. North*, in London Med. and Phys. Journal, vol. iii., p. 457.—*Gendrin*, Hist. Anat. des Inflammations, t. i., p. 493, 659, 691.—*Rousseau*, in Archives Génér. de Méd., t. vi., p. 321. 1824.—*Louis*, in Ibid., t. iv., p. 536; t. v., p. 5; et t. xii., p. 487.—*Andral*, in Nouveau Journ. de Méd., t. xv., p. 193.—*Rigot* et *Trousseau*, in Archives Génér. de Méd., t. xii., p. 169, 583.—*Pasquali*, in Ibid., t. x., p. 437.—*Lebidois* et *Cottereau*, in Ibid., t. xiii., p. 365.—*R. Prus*, Recherches Nouvelles sur le Cancer de l'Estomac, &c., 8vo. Paris, 1828.—*Chomel*, Dict. de Méd., t. x., art. *Gastrite.*—*C. Billard*, De la Membrane Muqueuse Gastro-Intestinale dans l'Etat sain et dans l'Etat Inflammatoire, 8vo. Paris, 1825.—*P. C. A. Louis*, Du Ramollissement, &c., de la Memb. Muqueuse de l'Estomac, 8vo. Paris, 1835; et Recherches sur la Maladie, connue sur le Nom de Gastro-Entérite, 2

tomes, 8vo. Paris, 1829.—*Pitschaaft*, in *Rust's* Magazin für die gesammte Heilkunde, 2d Heft, 1826; and Edinb. Med. and Surg. Journ., vol. xxvi., p. 451.—*J. Sym*, Case of Perforation of the Stomach, in Edinb. Med. and Surg. Journ., vol. xxvi., p. 290.—*Soemmering*, in Ibid, vol. xxvi., p. 212 and p. 214. (*Melanosis of.*)—*J. Syme*, in Ibid., vol. xliv., p. 113.—*Beilby*, in Ibid., p. 257.—*W. Brown*, in Ibid., p. 259.—*Craigie*, in Ibid., p. 262. (*Ulceration of.*)—*J. Gairdner*, On Softening and Perforation of the Stomach, in Transact. of Med. and Chirurg Society of Edin., vol. i., p. 311; and vol. ii., p. 331.—*E. J. Seymour*, in Transact. of Med. and Chirurg. Society of London. vol. xv., p. 222.—*J. N. Weekes*, Of Rupture of the Stomach, in Ibid., vol. xiv., p. 447.—*Yelloly*, in Ibid., vol iv., p. 371.—*Crampton*, Rupture of the Stomach, in Ibid., vol. viii., p. 228.—*Elliotson*, in Ibid., vol. xiii., p. 26. (*Ulceration and rupture.*)—*B. Travers*, in Ibid., vol. viii., p 231.—*T. Chevalier*, in Ibid., vol. v., p. 93.—*Lieyminier*, in Edinb. Med. and Surg. Journ., vol. xxvi., p. 212.—*J. Macfarlane*, in Glasgow Med. Journ., vol. ii., p. 170. (*On spasm or cramp of: an instructive memoir.*)—*Anon.*, in Ibid., vol. ii., p. 341. (*An excellent paper on spontaneous perforation of the stomach.*)—*Barras*, Traité sur les Gastralgies et les Entéralgies, &c., 8vo. Paris, 1827.—*C. Billard*, Traité des Maladies des Enfans Nouveaux-nés et à la Mamelles, &c., p. 319, 8vo. Paris, 1828. (*Gelatiniform softening.*)—*R. Carswell*, Edin. Med. and Surg. Journ., vol. xxxiv.—*J. Abercrombie*, Pathological and Practical Researches on Diseases of the Stomach, the Intestinal Canal, the Liver, and other Viscera of the Abdomen, 8vo. Edin., 1828.—*J. Johnson*, Essay on the Morbid Sensibility of the Stomach, 8vo. Lond., 1829.—*A. Pompart*, Traité des Mal. des Voies Digestives et leurs Annexes, &c., 8vo. Paris, 1829.—*A. Monro*, Morbid Anatomy of the Gullet, Stomach, and Intestines, 2d ed., 8vo. Edin., 1830.—*Andral*, Clinique Médicale, 2d ed., t. iii. et iv.—*Cruveilhier*, Anat. Pathol. du Corps Humain, fol., livrais iv., vii., et x. Paris, 1836.—*C. B. Chardon*, Pathologie de l'Estomac, des Intestins, et du Péritoine, 2 vols. 8vo. Paris, 1832.—*W. Stokes*, in Med. and Surg. Journal. Feb., 1834.—*M. Hall*, in Ibid., vol. iii., p. 141.—*W. E. Horner*, in London Med. and Phys. Journ., vol. lix., p. 113, 208, and 304.—*Ebermaier*, in Ibid., vol. lx., p. 302, 422.—*Rostan*, Cours de Médecine Clinique, t. ii., p. 6, et *pluries*.—*Recamier*, Recherches sur le Traitement du Cancer, 2 tomes, t. ii., p. 44. Paris, 1829.—*Graves*, in Dublin Medical Journal, vol. ii., p. 175. (*Fungoid disease between the orifices without sign of organic disease of stomach.*)—*J. Armstrong*, Morbid Anatomy of the Bowels, Liver, and Stomach, plates, 3 fasc., 4to. London, 1829.—*Thomson*, Annals of Médecine, vol. i., p. 437, and No. 13, p. 387.—*Henderson*, Edin. Med. and Surgical Journ., p. 94. July, 1836.—*R. Bright*, Guy's Hospital Reports, vol. i., p. 598. (*Displacement of stomach.*)—*Addison*, Lancet, Nov. 12, 1836; Ibid., p. 43. Oct. 1, 1836. (*Cancer of stomach not indicated by symptoms.*)—*Crisp*, in Ibid., p. 432. Dec. 16, 1837. (*Perforation of.*)—*Whitehouse*, in London Medical Gazette, p. 610. Jan. 13, 1838. (*Perforation of.*)—*L. Parker*, in Med. and Chirurg. Review, vol. xxix., p. 97, 641.—*Lefevre*, in Brit. and For. Med. Review, p. 221. July, 1838. (*Spontaneous perforations of.*)—*W. Stokes*, Cyclop. of Pract. Med., art. *Gastritis*; Descriptive Catalogue of the Pathological Specimens contained in the Museum of the Royal College of Surgeons of England, vol. iii., p. 51–62, Nos. 1139 and 1175.—See also the *Bibliography* and *References to arts.* Colon, Digestive Canal, Duodenum, Indigestion, and Pyrosis.

[Am. Bibliog. and Refer.—*Julius Vogel*, Am. Ed. Path. Anat. of the Human Body. Phil., 1847.—*S. D. Gross*, Path. Anatomy.—*W. E. Horner*, Path. Anatomy, and in Am. Jour. Med. Sci., vol. i., p. 1.—*R. Dunglison*, Practice of Med.—*S. G. Morton*, Am. Ed. Macintosh's Practice.—*John Bell*, Lectures on Pract. Medicine (Bell and Stokes).—*T. Stewardson*, Am. Ed. Elliotson's Practice.—*A. Sidney Doane*, Am. Ed. Good's Practice of Med.—*N. Chapman*, On Diseases of Thoracic and Abdominal Viscera; and Monograph on Diseases of the Stomach, in Am. Jour. Med. Sci., vol. xxv., N. S., p. 77.—Wound of the Stomach and Removal of a portion, with Recovery, West. Journ. Med. April, 1838.—*G. O. Sumner*, Cancer of Stomach, &c., Am. Jour. Med. Sci., vol. xx., N. S., p. 388.—*Benjamin Rush*, Medical Inquiries, vol. iii., p. 172. Phil., 1809.—*P. S. Physick*, Med. Repository, vol. v., p. 129. New York.—*C. A. Lee*, Pathological Appearances of the Stomach, produced by alcoholic Drinks, in Boston Med. and Surg. Jour., vols. xxvi., xxvii.—*L. Pierce*, Perforation of the Stomach without Ulceration or softening of its Coats, Am. Jour. Med. Sci., vol. xiv., O S., p. 305.—*Levi Rawson*, Perforation of the Stomach by Ulceration, in Ibid., vol vi., p. 391.—*H. W. Roberts*, Scirrhus of the Stomach, Am. Med. Recorder, p. 235. 1828.—*Wm. Beaumont*, Experiments in the Case of A. San Martin, Am. Med. Recorder, Jan., 1825 and 1826; and Experiments and Observations on the Gastric Juice and Physiology of Digestion.—*D. Atkins*, Medical and Surgical Cases and Observations, plates, 8vo.—*S. H. Dixon*, Essays on Path. and Ther., 2 vols. 8vo.—*William M. Carpenter*, Perforation of Stomach, New Orleans Med. and Surg. Journal. 1845.—*J. M. Paul*, Trans. Phil. College of Physicians. 1845.—*L. Phinney*, Ulceration and Perforation of the Stomach, Bost. Med. and Surg. Journ., vol. xxiv., p. 159.—*J. G. Graves*, in Ibid., vol. xxiv., p. 181.—*Thomas Miner*, Indigestible Substances in the Stomach, vol. ix., p. 123.—*J. C. Howard*, in Ibid., vol. v., p. 348.—Ibid., Editorial, vol. xi., p. 762.—*J. G. Porter*, Cancer of Stomach, Am. Journ Med. Sci., vol. xxx., p. 377.—*David Prime*, Transposition of the Stomach and Duodenum, in Ibid., vol. i., p. 558.—*J. B. S. Jackson*, in Ibid., vol. i., p. 365.—Review of *Langston Parker*, On the Stomach in its Morbid States, &c., in the New York Journal of Medicine, vol. xi., p. 167 (By *H. D. Bulkeley*); and on Perforations of the Stomach from Poisoning and Disease, in Ibid., vol. i., p. 466.—*George B. Wood*, Practice of Medicine.—*J. Stewart*, Am. Ed. Transl. of Billard on Diseases of Children.—*James Jackson*, in Memoirs of. Bost., 1835.]

STOMATITIS. — Synon. — *Stomatitis* (from στόμα, the mouth). *Stomacace, Oris Vitium, Buccitis. Buccite, Stomatite, Inflammation de la Bouche*, Fr. *Inflammation of the Mouth.*

Classif. — III. Class, I. Order (*Author in Preface*).

1. Defin.—*Inflammation affecting the mouth, especially the gums and cheeks, attended by more or less constitutional disturbance, and characterized, as respects the local changes, by the nature of this disturbance, by the causes, and by the state of vital power.*

2. Inflammation of the mouth, or stomatitis, may be either a primary, or a secondary, or sympathetic affection. It is rarely limited to the gums and cheeks, but extends more or less, in most of its forms, to the fauces and pharynx, and even partially to the tongue and lips. According to the sthenic or asthenic character of the inflammation—to the local changes and the constitutional disturbance—to a previously healthy, or to a cachectic or contaminated state of the system—and to the influence of the exciting causes, stomatitis presents several *species*, more or less distinct, and hence deserving of being treated of as specific affections, yet, owing to their seat, and not infrequently to their consequences, requiring to be viewed as generically related to each other. The several affections which may be classed under the present head appear, either primarily or consecutively, under so different circumstances, that it may be truly stated that there are few diseases affecting the same parts so dissimilar to each other as these are. This dissimilarity, arising, as just stated, from the different exciting causes of each, from the states of vital power and of the circulating fluids, from the nature of pre-existing disease, and from the age and various other circumstances of the patient, gives occasion for the arrangement of the several forms of stomatitis into the following *species*: 1st, simple or erythematic, *stomatitis simplex*; 2d, vesicular, *st. vesiculosa*; 3d, pultaceous, *st. pultacea*; 4th, mercurial, *st. mercurialis*; 5th, pseudo-membranous, *st. pseudo-membranacea*; 6th, ulcerated, *st. ulcerata*; 7th, gangrenous or phagedenic, *st. phagedænica*. The *second* and the *third* of these *species* I shall describe under the head Thrush, the term usually applied to them; the others will be briefly treated of at this place.

3. I. Stomatitis Simplex, *simple or erythematic inflammation of the mouth*—*Buccite, Aphthes érythématiques*—is characterized by redness, heat, dryness, pain, and slight swelling of a part or of the whole of the mucous membrane lining the mouth. It is most frequently limited to either the arch of the palate, to the tongue, to the gums,

or to the cheeks. It is often extended to two or more of these, but it more rarely invades the whole of the buccal surface. It frequently extends backward to the isthmus of the fauces, to the pharynx, and even to the upper part of the œsophagus. It is not an infrequent complication of gastritis, or gastro-enteritis, or of bronchitis, and is generally more or less remarkable in the exanthematic fevers and in an advanced stage of hectic. When the inflammation has followed a local irritant or poisonous substance, then the pain, heat, and swelling are often very severe, and the effect more diffused. In some instances the inflammation is attended by dryness, in others by a discharge of a ropy mucus, mixed with saliva, more or less abundant, according to the nature of the exciting cause. Occasionally the irritation extends along the Eustachian tube to the ear, and in many instances the tonsils are more or less affected.

4. *A.* Simple stomatitis thus presents numerous phases or states, as it is more or less general or limited, or according to its severity, to its complications, to the age of the patient, and more particularly to its cause. It may be general or diffused, or limited to patches or to parts, or consisting of numerous points. It may or may not be attended by the symptoms of general fever, which usually assumes either an asthenic or sthenic character, according to the severity of the attack and the constitutional power of the patient. It generally presents acute features, and terminates in a few days by resolution, without either suppuration or ulceration, the epithelium being commonly detached. But suppuration is occasionally produced when the inflammation has been intensely excited by an energetic irritant poison, or even by the more common irritants in unusual quantities. I have thus seen a very general stomatitis, with profuse suppuration, follow the introduction of a quantity of mustard into the mouth. Ulceration is more frequent than suppuration, and is seen chiefly in the gums, insides of the cheeks, and on the surface of the tonsils. Generally, however, the inflammation has become chronic before ulceration to any considerable extent takes place.

5. *B.* The *chronic state* of simple stomatitis is chiefly confined to the gums, and is often kept up by carious teeth or stumps of teeth. In the worst of such cases, the gums not only ulcerate, but the alveolar processes, either partially or more generally, become absorbed, and the teeth fall out. These cases are commonly symptomatic of general cachexia, or of prolonged disorder of the digestive organs, especially chronic dyspepsia or chronic gastritis.

6. *C.* The *treatment* of simple stomatitis is generally easy, when the affection is produced by a manifest irritant cause; for the removal of this cause, and rinsing the mouth frequently with cooling and demulcent fluids, will be efficacious in the course of a few days. When this affection is a part only of a more general and a more serious complaint, the local means can be subservient only to more constitutional and energetic remedies, and these must be such as the nature of the complaint will warrant. The state of the alimentary canal and of the digestive organs should receive particular attention, and morbid secretions and excretions, and fæcal accumulations, be freely evacuated. In many cases, washing out the mouth with camphor water, or with a decoction of marshmallows, containing a little nitrate of potash or sulphate of alumina, or, in more painful cases, holding the open mouth over the vapour of hot water, into which some vinegar and scraped camphor has been put, will be sufficient to remove the disorder, especially when aided by suitable purgatives. In more chronic and obstinate cases, especially if ulceration have taken place, strong solutions of the nitrate of silver, or weak solutions of the bichloride of mercury, may be required. Most of these states of the disorder, even when unconnected with secondary syphilitic disease, depend upon cachexia and chronic disorder of the digestive organs, and to these latter the treatment should be mainly directed. For these obstinate and complicated states, the means about to be prescribed for a severer variety of this complaint will be found appropriate (see § 31, *et seq.*).

7. II. Pseudo-membranous Stomatitis.—*Stom. Pseudo-membranacea.—Stomatite Couenneuse, St. Diphthéritique, Diphthérite Buccale*, Fr.—This peculiar form of stomatitis, as it affects either the mouth or throat only, or as it extends not only to both, but also to the pharynx, larynx, and even to either the trachea or œsophagus, was first accurately described by M. Bretonneau, and subsequently by M. Trousseau and Dr. Mackenzie, by whom it was observed to occur in an epidemic form. In some districts of France, especially the more extended or diffused state, it was on several occasions a remarkably prevalent and fatal malady, and was considered by the best informed writers to have been propagated by infection. This very severe and epidemic form of *angina* will receive due attention when the diseases affecting the Throat are described. I shall, therefore, notice at this place only the less severe and limited form of the malady, which affects the mouth primarily, and is most frequently confined to this part.

8. *A. Pseudo-membranous stomatitis* has been confounded with various other affections of the mouth. It may assume either an *acute* or a *chronic* form, and is generally more or less diffused when acute, and limited to one part when it assumes the latter form. It is observed chiefly on the gums, insides of the cheeks and lips, and on the point or around the tongue. In the *acute state*, it first appears in the interior of the mouth in the form of small, irregular, rounded or oblong membranous patches of a grayish-white colour. Around these patches the surface is red, and the parts are painful and hot, a sense of heat or burning being complained of. The breath is fetid, and the submaxillary glands enlarge. As the disease proceeds, the patches of membranous exudation extend, become more or less detached, and are succeeded by others, and the intervening surfaces are red and swollen. The tongue is swollen. The mouth is continually open, allowing the escape of altered saliva. The enlargement of the lymphatic glands increases; the face swells; the breath becomes more fetid; and the pulse more quick or rapid, and generally soft, open, and full, or weak. With the increasing severity of the accompanying fever, the disease extends to the throat, and even to the respiratory and digestive mucous surfaces, thereby occasioning great or very imminent danger.

9. This form of stomatitis may be confounded with the Thrush, or with *mercurial stomatitis*, from which latter it may be distinguished by absence of the cause, and of the mercurial fetor

of the breath. It is more closely allied to the thrush, from which it differs chiefly in the larger patches of exudation at the commencement of the disease, in the more rapid and continuous extension of these patches, in the greater amount of fever and of swelling of the adjoining parts, and in the more advanced age of the children most frequently attacked, the thrush occurring generally, or oftenest, in much younger children than this form of stomatitis, commonly in infants during or soon after lactation.

10. Pseudo-membranous stomatitis may terminate in resolution, the swelling and redness diminishing, and the membranous exudations being either detached or absorbed; or it may pass into the chronic state; or it may go on to ulceration, or even to gangrene. The first of these terminations is the most frequent, the parts healing without leaving any cicatrix. But the affection is not infrequently chronic, usually after a more or less acute state. In the acute form, it often extends to the pharynx and respiratory passages, and sometimes also to the digestive mucous surface; and, when thus complicated, it generally terminates fatally. In the chronic state, it is usually limited to the mouth, and may continue for several weeks or even months.

11. Relapses are frequently observed in weak cachectic children, especially when confined in an unwholesome air or crowded apartment. M. Guersent states that the cases of this complaint in the hospital for children in Paris are very subject to relapses.

12. *B.* The *causes* of pseudo-membranous stomatitis are chiefly those which lower the constitutional powers and impair the assimilating functions. This complaint may occur at any age, but it is most frequent during the second dentition, and during the evolution of the molar teeth. It is very rare during lactation, but becomes more frequent from the first year of age, until the second dentition is completed. It is observed chiefly in autumn and winter; and in these seasons especially, and not infrequently also in the spring, it is almost endemic in some countries, whose climates are cold and humid, and in districts subject to inundations. In these particularly it may even become epidemic.

13. The *predisposing causes* are whatever impairs the general health, as impure air, unwholesome food, insufficient clothing, and want of cleanliness; living in cold, low, and humid cellars; crowded apartments and sleeping-places; want of exercise in the open air; and privation of light and sunshine, and of due ventilation. M. Guersent states that this form of stomatitis is almost endemic in the hospital for children in Paris, especially in the wards appropriated to ophthalmic, cutaneous, and scrofulous affections; and that boys are more affected than girls. It has been supposed to have been propagated by contagion, in circumstances favourable to this mode of communication; but the evidence of the possession of this property by this affection is not always conclusive, although cases have appeared to warrant a belief in the existence of it, especially when the disease is prevalent.

14. *C. Treatment.*—Van Swieten advised the application of the hydrochloric acid in a proportion of honey, varying with the severity of the case (from one fourth or one third to three fourths of the former), by means of a small piece of sponge attached to a small stick, to the membranous exudations. But care should be taken that this application should extend as far as the exudation. Generally one or two applications in the twenty-four hours are sufficient. At the same time, a terebinthinate embrocation, such as No. 296, or No. 311, in the *Appendix*, should be applied by means of flannel or spongio-piline around the throat, or along the sides of the lower jaw. After a few applications of the acid and honey, or, in the intervals between the application of them, a gargle or wash, consisting of the decoction of cinchona and hydrochloric acid, or any other astringent gargle, may be employed. In some cases, I have found a varying proportion of borax and honey efficacious; and when the patients have been old enough to use a gargle, then a saturated solution of borax, in any suitable vehicle, has also been used. A strong solution of alum, or alum in fine powder, with acacia-powder or mucilage, has also been recommended by Bretonneau and others; while the nitrate of silver, in various states of solution, or even in substance, has been advised by many. More recently, the chlorides, especially the chloride of lime and the chloride of zinc, in varying grades of solution, according to the severity of the disease, or in the state of powder conjoined with other substances, have been severally prescribed by myself and others.

15. If the disease have advanced to simple or to phagedenic ulceration, the above means should be employed in more energetic or concentrated forms; and such other means should be used as will support the vital powers and resistance, and thereby change the morbid action locally. In all cases, indeed, but in these especially, internal and constitutional means ought to be appropriately prescribed. Some writers have advised the application of leeches to the throat or neck, &c. I have often been called to patients after recourse has been had to them, but I have rarely seen much benefit derived from them. I would not say that they should not be applied in the more sthenic cases, or in robust or plethoric patients; but these latter are rarely attacked by the disease; and when they are, the employment of leeches for them is likely to be of service, especially when the applications to the mouth and the embrocations to the throat and neck, advised above (§ 14), are also duly resorted to. In most cases, the preparations of cinchona, with ammonia, or with the fixed alkalies, or with diaphoretics, as the liquor ammoniæ acetatis and spiritus ætheris nitrici, are beneficial, especially when the pulse is quick and soft, and the flesh is flabby or soft. In some it will be requisite to administer the most powerful tonics and stimulants, as the preparations of cinchona with hydrochloric acid and hydrochloric ether, tincture of serpentaria, &c.; and even to allow a sufficient quantity of wine in arrow-root or sago. The bowels should be freely opened by the usual means, or by equal quantities of castor oil and oil of turpentine, administered by the mouth, or in enemata, or in both ways, according to the urgency of the case. If the disease assume *a chronic form*, internal or constitutional means are always required; and of these means, change of air, especially to a warm and dry locality, is one of the most important and successful, especially when aided by an appropriate use of one or more of the remedies already noticed.

16. III. Stomatitis Mercurialis—*Mercurial*

stomatitis—is one of the more common forms in which the poisonous effects of mercurials manifest themselves. It has, therefore, been described, and fully treated of, in connexion with other injurious effects of mercury, in the article POISONS, from § 562 to 594 inclusive; § 568, 580–587, and 593, more particularly relating to mercurial stomatitis.

17. IV. STOMATITIS ULCERATA—*Ulcerated Stomatitis—Cancrum Oris*—may be an advanced stage of either simple stomatitis or of pseudo-membranous stomatitis.—*A.* It may also commence with inflammation of the external surface of one or more of the gums, most frequently of the lower jaw, and generally on both sides. With the inflammation, swelling and œdema are often very considerable, ulceration soon appearing over the alveolæ and near the teeth. The cheeks and face are swollen; the sub-maxillary glands are tumefied; the mouth is opened with great difficulty; and saliva with mucus fills the mouth, and prevents a satisfactory view of the diseased surface. A coppery, unpleasant taste is complained of, and a peculiar fetor of the breath is remarked. Heat, tenderness, and swelling of the face increases, and ulceration extends over the gum, sometimes exposing the alveolar processes, and often to the cheeks, if the disease be not early checked. It may remain stationary for some days, especially when partly controlled by treatment. In some cases more or less hæmorrhage takes place from the ulcerated parts. The febrile symptoms are generally of an asthenic or low character, the pulse being soft, weak, frequent, or small, and the skin cool or natural, excepting that of the face and neck, and the bowels confined or irregular.

18. This form of stomatitis is most frequently seen in children between the first and second dentition, after weaning, and during recovery from exanthematous fevers, especially from scarlet fever. It generally occurs in cachectic and debilitated subjects, and in the children of the poor, that are ill-fed, and live in low, close, and crowded and ill-ventilated apartments. It is not infrequently superinduced by disorders of the stomach and bowels, and should be viewed as a very serious malady, especially when it appears in the circumstances now mentioned, and more particularly when it occurs after scarlet fever; the prognosis, however, should depend chiefly on the constitutional symptoms, especially when these are correctly interpreted, and upon the absence or presence of visceral complications.

19. *B.* A *variety* of ulcerative stomatitis sometimes occurs in adults, consecutively upon exhausting discharges, and as a sequela of other diseases. It occasionally appears in delicate females during lactation, and in the course of debility, or of debility conjoined with cachexia, produced by other depressing or exhausting causes. The disease in these cases usually commences with inflammation of one, seldom of both, sides of the tongue, and extends to the inside of the cheek. In some cases, one or more very small, hard, and painful sores first appear on the side of the tongue, which ulcerate, with hard and elevated margins, and are followed by a more extended inflammation; and in others these ulcers supervene upon previously existing inflammation. As the disease proceeds, the interior of the mouth appears red and inflamed, is very painful, and so tender that fluids only, and these of the blandest kind, can be received into it. The tongue is red, smooth, or glossy, and a copious flow of saliva takes place from the mouth. There is at first neither loss of appetite nor fever; but as the affection extends over the internal surface of the mouth, cheeks, and tongue, fever supervenes, and the stomach and bowels become irritable, the morbid irritation extending to the pharynx and along the œsophagus to the stomach and bowels; diarrhœa, emaciation, and extreme exhaustion sometimes supervening, and even terminating in death. Drs. HALE, BACKUS, WILSON, and HOLT, of the United States, have described this variety of stomatitis, and state that it occurs chiefly in women when suckling, or in an advanced stage of pregnancy. But it is not peculiar to them, cases of it occurring, on rare occasions, in the circumstances already stated, especially when debility is associated with more or less visceral disease.

20. *C.* The *treatment* of ulcerated stomatitis should be mainly constitutional, means being used to improve the vital powers of resistance, and to prevent the extension of the local changes. The states of the excretions should be carefully ascertained, especially of the urine, and the treatment directed accordingly. In some cases, the treatment is beneficially commenced with an emetic of sulphate of zinc; and a purgative powder or draught, suitable to the state of the bowels and appearances of the stools, is often afterward required. The decoction of cinchona, with muriatic acid and muriatic ether, or with the nitro-muriatic acids, or with ammonia or the fixed alkalies, according to the state of the urine, is always more or less of service It may be necessary to have recourse to wine in addition to these or other tonics, or to the sulphate of quinine given in the compound infusion of roses, &c. The bowels should receive due attention during the progress of the case; and the occasional administration of an enema containing oleum terebinthinæ will generally be of service, as respects not merely the state of the bowels, but also the system generally.

21. The local affection has too commonly been viewed as local merely—as simply inflammatory; and the inflammation has too frequently been considered as of an ordinary sthenic kind, instead of asthenic, and requiring very opposite means to those often employed. Because there have been swelling, increased redness, enlargement or engorgement of the adjoining glands, leeches have often been prescribed, and have either increased the mischief or have had no beneficial influence on the disease. Cold applications to the neck or the throat have not been of greater service. I have generally employed, with benefit, embrocations to these situations, consisting chiefly of the terebinthinated and camphorated forms prescribed in various parts of this work and in the *Appendix*, and such applications or gargles to the affected parts as the age and circumstances of the case suggested. When the patient can use a gargle, then the decoction of cinchona, with hydrochloric acid, or with hydrochlorate of ammonia, or with alum, or with tincture of myrrh, or of krameria; or strong tar-water; or various fluids containing creasote; or even the chloride of zinc, or of lime, in small quantities, may be severally tried, according to the peculiarities of the case and the effects produced.

22. Washes, lotions, linctuses, &c., are like-

wise of great service, especially when the former are applied directly to the parts by means of a sponge attached to a small stick or piece of whalebone. Washes or lotions may contain either the nitrate of silver, or the sulphate of zinc, or the chloride of lime, or the chloride of zinc. When a linctus is preferred, then the substance should be such as may be passed into the stomach not only without danger, but with benefit. Thus a linctus may be prescribed containing either the hydrochloric acid, or the oleum terebinthinæ, or the tincture of cinchona or of myrrh, or red wine, &c.; and when an emetic effect is desired, then the sulphate of zinc may be given in this way.

23. The *variety* of ulcerated stomatitis described by the American physicians as peculiar to pregnant and puerperal females requires also a restorative and tonic treatment. Dr. BACKUS advises, as local applications, mild astringent infusions, or a solution of nitrate of silver. Suckling in these cases ought always to be relinquished. Dr. HOLT states that the disease has invariably yielded to iodide of potassium, given in doses of five grains three times a day, a cure having been obtained in a very few days, often in two or three. Dr. WILCOX says that he has met with uniform success from the decoction of *Polygonum punctatum* of ELLIOT, made by boiling an ounce of the dried leaves and tops in a pint of water for twenty minutes, and employed as a gargle almost hourly.

[Dr. E. HALE has given a very good account of this form of the disease (*Trans. of the Mass. Med. Soc.*, vol. v., and *Amer. Journ. Med. Sci.*, April, 1842), which is chiefly copied by our author. After a gentle emetic of ipecac, Dr. H. rests the cure chiefly on tonics, such as the lime-water infusion of bark, &c. Carbonic acid, as in bottled beer, porter, and effervescing salts, was also found useful. Where there was much debility, sulphate of quinine was used with advantage. All stimulating tonics were found injurious, especially tinctures. Dr. H. attaches little value to local remedies. Dr. BACKUS, of Rochester, recommends chalybeates combined with rhubarb and aloes, as follows:

℞ Carb. Ferri, grs. lxv.; Pulv. Rhei et Aloes, ää, grs. xv. M. Ft. mass. in pil, 50 divid. Two to be taken twice or three times a day, or often enough to regulate the bowels.

We have found great benefit in this affection from the use of nitrate of silver locally, and the internal use of citrate of iron, aloes, and hydriodate of potash. The food should be chiefly milk and farinaceous articles.]

24. V. STOMATITIS PHAGEDENICA.—SYNON.—*Cancrum Oris — Cancer Aquaticus — Stomacace Maligna—Noma—Gangrenous Stomatitis—Water-canker—Sloughing Phagedena of the Mouth.*—This most dangerous and very often fatal affection presents, from the commencement, very different characters from those of the other forms of stomatitis. The gangrene or sloughing, which occurs consecutively of the forms of stomatitis already noticed is merely an occasional termination of these, owing either to neglect, or to general cachexia, or to extreme exhaustion or depression of vital power; but this malady is primarily and idiopathically distinct from the gangrena oris—from the gangrenous terminations of the other kinds of stomatitis.

25. *A.* The *literary history* of phagedenic stomatitis is briefly as follows: The disease appears to have been noticed by C. BATTUS, a physician in Amsterdam, as early as 1620; and VANDER WOORDE soon afterward designated it by the term *water-kanker*. ARNOLD BOOT, in 1649, described it by the names of *labrosulcium* and *cheilocace*, very probably confounding it with other forms of stomatitis. VAN RINGH assigned it the name of *scorbutic cancer;* and VAN LILL called it *noma, ulcus noma*, and *stomacace*. CALLISEN designated this malady *stomacace gangrenosa;* LENTIN, *ulocace;* and WENDT, *sphacelus of the mouth*. LUND, a Swedish physician, saw eleven children with this malady, which he named *noma*, and of these ten died. MEZA described it as he observed it in Denmark. Drs. COATES and JACKSON met with it in the United States, the former calling it *gangrenous ulcer* of the mouth, the latter, *gangagræpsis;* but they probably did not distinguish between it and other forms of stomatitis. It has also been noticed by C. F. FISHER, SIEBERT, C. G. HESSE, RUST, SCHMALZ, HILDENBRAND, GIRTANNER, JOERG, REIMANN, WEIGAND, HUETER, &c. The most detailed accounts of the disease have been furnished by A. L. RICHTER, GUERSENT, BLACHE, TAUPIN, RILLIET, and BARTHEZ. The first of these has described three varieties of this malady: 1st, the *noma scorbutica;* 2d, the *noma metastatica;* 3d, the *noma gastrica*—divisions which are more imaginary than real. The two last of these writers have adduced twenty-one cases of the disease, and, as well as M. GUERSENT, have appropriated much of what has been advanced by RICHTER. M. TAUPIN has described thirty-six fatal cases which occurred in the hospital for children in Paris.

26. *B.* The *symptoms* of phagedenic stomatitis are commonly swelling and hardness of one cheek or lip—of the cheek most frequently—without marked increase of heat or redness, and without much tenderness or pain, even on examination. Owing to the absence of acute or active symptoms at the commencement, the disease is often overlooked at first, or until it has made a dangerous progress. The tumefaction externally is, however, early attended by a waxy and glossy appearance, which is so characteristic as to direct the instant attention of the physician to the disease, although it may have been overlooked or unattended to by the friends of the patient. On examining the mouth, little or no redness or mark of inflammation is observed; but, in the internal surface of the swollen part, an ash-coloured or whitish eschar or slough of small size may be detected in the centre of the cheek, or in the commissure of the cheek and lower jaw, surrounded by hardness and swelling. The tongue is pale, flabby, or slightly loaded; the gums are pale and spongy. There are more or less marked indications of debility, exhaustion, and cachexia, with languor and fretfulness. The pulse is generally small, soft, and quick, but without much increase of temperature, until towards evening. The evacuations are unhealthy and offensive.

27. If the disease come under treatment at this early stage, a judicious treatment will frequently arrest its progress. But as it advances from this stage the danger increases. The slough or eschar on the inside of the cheek soon spreads, and even extends to the lips and gums, and is attended by a copious discharge of saliva, which is clear at first, but soon becomes turbid and mixed with mucus and a sanious matter. The breath is now very offensive. As the gangrenous disorganization thus extends, the external appearances indicate

the invasion of the integuments about the centre of the tumefaction. A vesicle or a pale or ashy spot appears in this situation, and soon becomes livid and sloughs. The discharge from the diseased parts is now remarkably contaminating and corroding, the lower lip, the angles of the mouth, and the alveolar processes, being not infrequently destroyed by it. The teeth often fall out, with dead portions of the alveolæ; and if death does not previously occur, both sides of the face may become affected, or the gangrene may extend to all the soft parts of the mouth and face, and even to the maxillary, the palatal, and the nasal bones.

28. As the malady thus proceeds locally, the constitutional symptoms are chiefly those of increasing vital depression and contamination of the circulating fluids. The cachectic indications are more and more apparent; the pulse more rapid, feeble, and small; and the bowels, which at first were confined, generally become much relaxed and extremely offensive. The urine is offensive, alkaline or phosphatic, or soon becomes ammoniacal. The general surface is usually cool; the extremities become cold; and life gradually, but quickly, ceases. From an early period, the disease may be *complicated* with more or less internal disease, more especially with latent or congestive pneumonia, or with an asthenic gastro-enteritis; but these are only contingent or occasional associations.

29. *C.* The *diagnosis* of phagedenic stomatitis is, from the commencement, sufficiently evident. The hard, indolent swelling, and the peculiar glossy or waxy appearance of its outer surface, and the small slough in its internal surface, are quite characteristic of this malady. The *prognosis* should be unfavourable or stated with great caution from the first. If the disease be seen at the early or œdematous stage, and be treated in, or can be removed to, a wholesome situation, a judicious treatment may arrest its progress; but if gangrene be established, although recovery may take place, disfigurement cannot be prevented; and if sloughing and the constitutional symptoms have advanced and are severe, recovery cannot be expected. When the disease appears in hospitals for children the issue is generally fatal.

30. *D.* The *causes* of phagedenic or gangrenous stomatitis are those already noticed as occasioning the other forms of stomatitis, more especially pre-existent cachexia, depression of vital power, or exhaustion by previous disease, by exanthematous fevers, by protracted disorder of the pulmonary, the digestive, and assimilating organs, and by living on unwholesome and insufficient food. Low, cold, and humid apartments, particularly cellars, ground floors, &c., are also not infrequent concurrent causes of the disease. The specific action of mercury may favour or more directly occasion it, although it more frequently appears independently of this mineral, and when none of its preparations have been taken. It occurs chiefly between the ages of two and nine years, but most frequently from three to six years of age. The air of hospitals for children is most commonly productive of this malady; and, when treated in the wards of these hospitals, recovery rarely takes place. M. Taupin has seen thirty-six cases in the hospital for children in Paris, and they were all fatal.

31. *E. Treatment.*—Prompt and decided measures are required for this form of stomatitis. The patient should be removed into a dry, warm, and well-ventilated apartment, and the causes of the disease as far as possible avoided. The state of the cheeks and mouth should be very carefully ascertained, and means appropriate to the existing changes instantly applied. If no slough have as yet appeared in the interior of the cheek, the terebinthinate embrocation (◊ 14, 21) should be applied externally, and the internal surface be washed by a lotion of strong tar-water. If the latter cannot be readily obtained, one part of oleum terebinthinæ ought to be mixed in three of honey, and applied to the inside of the cheek and gums twice or thrice daily. In some cases, I have given a warm stimulating emetic of sulphate of zinc, and a small quantity of capsicum, with marked advantage, and subsequently a stomachic aperient draught, the operation on the bowels having been promoted by a terebinthinate enema. During the treatment of the early stage of the malady, the decoction of cinchona, with muriatic acid and ether, or with ammonia, or with chlorate of potash, or the quinine or other tonics, as advised above (◊ 20), should be given at duly regulated periods, between the administration of suitable nourishment.

32. In a farther advanced stage, when a slough has become very manifest in the mouth or cheek, the part ought to have solid nitrate of silver, or strong hydrochloric acid applied to it, the surface being frequently washed by the lotions already mentioned, or by a strong solution of nitrate of silver, or muriate of ammonia, or with washes containing the chloride of lime, or of zinc, or creasote, with camphor and myrrh. These latter will tend to arrest the sloughing, will correct the fetor, and will counteract the contaminating influence of the discharge from the diseased part. During this period, cinchona and other tonics, in combinations already mentioned, should be prescribed; and beef tea, with rusks; the yolks of eggs, with wine or brandy; turtle soup, and other nourishing, digestible, and restorative articles ought to be freely supplied. Instead of wine, or in addition to it, in the more extreme cases, the mistura spiritus vini Gallici may be administered in doses suitable to the age of the patient. From 1821 until 1825 or 1826, I frequently had recourse to the chlorate of potash in this and in other asthenic diseases, at the Infirmary for Children; but I seldom found it of great service when given alone at advanced stages of these maladies. It was, however, often prescribed in conjunction with other remedies with much benefit, and especially in the forms stated in early parts of this work—with the decoction and compound tincture of cinchona, or with cascarilla, camphor, &c.

33. When sloughing has made still farther progress, the local means already advised ought to be more frequently employed, and in more concentrated forms. Turpentine mixed with honey, in equal quantities, or thickened with liquorice powder, should be applied to the part, and if the external surface of the swelling become livid, the same application ought to be made to it; or an incision should be made into it, and the incised part frequently injected with either of the lotions or washes already mentioned.. MM. Baron, Billard, and others, have recommended the actual cautery, at a white heat, to be applied to the incised part. Of this last I have no experience and little hope. The other means I have found successful when the constitutional powers have been duly supported, and when the disease had not

advanced to a hopeless condition before medical aid was obtained. When great irritability and distress have appeared in cases of this malady, I have generally conjoined some preparation of opium with the local means, and prescribed it internally with camphor and other remedies, having due regard to the age of the patient, and directing it with much caution at an early age.

[The formula of Dr. B. H. Coates, of Philadelphia, has been found very successful in the treatment of these cases.

℞ Sulph. Cupri, ʒij.; Pulv. Cinchonæ, ʒss; Aquæ, ʒv. M. To be applied twice a day very carefully to the ulcerations and excoriations.

The *Sulph. Zinc.* (ʒj. to ʒj. water) is also useful as a local application; but the most important indication is to support the constitutional powers by a free internal use of stimulants and tonics. All the cases of this disease that have fallen under our observation have been among the children of the poor, and of orphan asylums, in whom the breathing of impure air, and the use of crude and innutritious diet, had brought on such condition of the fluids as to powerfully predispose the system for such forms of disease.]

Bibliog. and Refer.—*C. Battus*, Manuel de Chirurg. Amst., 1620.—*J. Muys*, Prax. Chirurg. Rat. 1684.—*A. Boot*, Observ. Med., &c., 8vo. London, 1649.—*Huxham*, Reports. July, 1745.—*Van Swieten*, Comment., &c., t. iii., p. 197.—*A. L. B. Jourdain*, Traité des Maladies de la Bouche, &c., 2 tomes, 8vo. Paris, 1778.—*Berthe*, Mém. de l'Academ. Roy. de Chirurg., t. v. p. 381. (*Gangrène Scorbutique, &c.*)—*Colombier*, in Hist. de la Soc. Roy. de Méd., p. 186. 1779. (*Stomacace Maligna.*)—*Meza*, in Acta Hafn., t. ii., p. 117.—*Lentin*, Beytrage, p. 246.—*F. A.*, Tratado de las Enfermedadas de la Boca, 4to. Madrid, 1793.—*J. B. Gariot*, Traité des Maladies de la Bouche, 8vo. Paris, 1805.—*Alard*, in Corvisart's Journ. de Médicine, &c., p. 354. 1812. (*States the disease to be contagious.*)—*Mende*, in Hufeland und Himley Journ. der Pract. Heilk., p. 24. Oct., 1809. (*He considers the disease to be contagious.*)—*Baron*, Bulletins de la Faculté, &c., t. v., p. 145. Paris, 1816.—*M. Hall*, in Edin. Med. and Surg. Journ., vol. xv., p. 547.—*Cumming*, in Dublin Hospital Reports, vol. iv., p. 18.—*Evanson* and *Maunsell*, A Practical Treatise on the Management and Diseases of Children, 2d ed., 8vo. 1838.—*A. L. Richter*, Der Wasserkrebs der Kinder, Berlin, 1828; et in Journ. des Progrès, t. iii., p. 1. 1830.—*Hueter*, in Journ. des Progrès de Sc. Méd., t. xviii., p. 1. 1829.—*Billard*, Traité des Mal. des Enfants, &c., 8vo. Paris.—*H. Hunt*, in Transact. of Med. and Chir. Society, vol. xxvi., 142.—*C. Hawkins*, Ibid., p. 151.—*B. H. Coates*, North Amer. Med. and Surg. Journ., vol. ii., p. 20.—*Murdock*, in Journ. Hebdom. de Méd., t. viii., p. 232. Paris, 1832.—*Taupin*, in Journ. des Conn. Medico-Chirurg., t. vi., p. 137. Paris, 1839.—*F. F. Backus*, in Am. Journ. of Med. Sciences. Jan., 1841.—*H. D. Holt*, in New York Journ. of Med., vol. x., p. 372.—*R. Wilcox*, Amer. Med. and Surg. Journal, N. S., vol. xvi., p. 248.—*Rilliet* et *Barthez*, Traité des Maladies des Enfants, t. ii., p. 152.—*G. B. Wood*, Treatise on the Practice of Medicine, 2d ed., vol. i., p. 469.—*Symonds*, in Library of Practical Medicine, vol. iv., p. 34.—*Guersent* et *Blache*, in Dict. de Med., art. *Stomatite.*

[Am. Bibliog. and Refer.—*J. Bell*, Lectures on the Practice of Physic, 2 vols. Phil., 1848. (Dr. B. has treated the subject of *Stomatitis* in a very able and judicious manner through three lectures.)—*B. H. Coates*, N. Am. Med. and Surg. Journ., vol. xi., p. 20.—*F. F Backus*, Am. Journ. Med. Sci., vol. i., N. S., p. 114. 1841.—*W. P. Dewees*, Am. Pract. of Med.—*J. Stewart*, Trans. of Billard.—*G. B. Wood*, A Treatise on the Practice of Medicine, 2 vols. Phil., 1847.—*Lewis Shanks*, On Endemic Sore Mouth and Diarrhœa peculiar to nursing Women, Amer. Jour. Med. Sci., vol. iv., N S., p. 300. (Dr. S. maintains that the predisposing cause of the disease in nursing females is malaria, combined with humidity of the atmosphere, and is preceded and attended with deranged secretions of the stomach and liver. He recommends alteratives of mercury, iron, ipecac, and aloes, with alkalies; diet, rice, barley, arrow-root, stale bread, and boiled milk; as a wash, the infusion of *blood-root* with borax or burned alum. The child to be weaned in bad cases.)—*E. Hale*, Med. Com. of Mass. Medical Soc., vol. v., p. 1, 1830; and copied in Am. Jour. Med. Sci., vol. iii., N. S., p. 511.—*J. Hays*, in Ibid., vol. iii. (In noticing Dr. Hale's article, Dr. Hays states that the late Dr. Dewees never met with it in Philadelphia, nor any of his friends with whom he had conversed on the subject; and yet it is a very common disease in many parts of our country.)—*B. W. Taylor*, Remarks on a Species of Sore Mouth peculiar to nursing Women, Am. Jour. Med. Sci., vol. v., p. 119.—*C. B. Hamilton*, in Ibid., vol. viii., O. S., p. 357.—*M. L. North*, Nurses' Sore Mouth cured by Congress Water of Saratoga, Boston Med. and Surg. Journal, vol. xxii., p. 201.—*T. M. Tweed*, Observations on Cancrum Oris, Western Lancet, vol. vi., p. 12.]

STOMATORRHAGIA.—*Hæmorrhagia Oris.*—*Hæmorrhage from the Mouth.*—See *art.* Hæmorrhage, § 85, *et seq.*

SUCCUSSION.—Syn.—*Succussio; Secousse, Succussion*, Fr. *Das Schütteln, die Erschütteln*, Germ. *Hippocratic Succussion of the Trunk.*

Classif.—General Pathology—Semeiology.

1. *Succussion of the trunk* of the body was mentioned by Hippocrates in several parts of his works, and was employed by him to ascertain the presence of purulent and other fluids in the cavities of the chest. Morgagni, in noticing this mode of diagnosis, admitted its frequent failure, but in such a way as evinced his ignorance of the circumstances to which failure is owing. Laennec first clearly demonstrated the conditions upon which the evidence furnished by succussion depends, and since his time this mode of investigating diseases of the chest has been resorted to whenever they have been supposed to have been attended by effusion of fluid into the thoracic cavities. It is chiefly in *pneumathorax* that succussion produces the *sound of fluctuation* in the pleural cavity, for it is necessary to the production of this sound that, along with the fluid, more or less air should also be present.

2. *Succussion* is performed, as recommended by Hippocrates, by seizing both shoulders of the patient while he is seated, and, having applied the ear to the side of the thorax, by jerking the trunk, or by abruptly turning or shaking the trunk, a sound resembling the splashing or fluctuation of water is then heard, if a fluid and air be contained in the cavity. If the cavity contain no air, although filled by a liquid, no sound will be produced, for the collision of the fluid with air is requisite to the production of sound, and the greater the quantity of air the more distinct will be the sound of fluctuation or splashing. Care should be taken, during this mode of investigation, to distinguish between the sound of fluctuation produced by succussion in the stomach, when this organ contains much air and liquid, and that which is produced in one of the thoracic cavities. A mistake will be prevented by the slightest attention, for the seat of fluctuation is generally easily manifested. In many cases, the patient himself can perform succussion; and it is often useful to cause him to perform it while the physician applies his ear to the presumed seat of effusion. Succussion is useful chiefly in the diagnosis of pneumo-hydrothorax or pneumathorax. (See *art.* Pneumathorax, § 17.)

Bibliog. and Refer.—*Hippocrates, pluries.*—*Morgagni*, De Sed. et Caus. Morb., Epist. xvi., 27.—*Laennec*, De l'Auscultation médicale, &c., t. ii. Paris, 1819.—*Martin Solon*, Dict. de Méd. et Chirurg. Prat., art. *Succussion.*—*W. Stokes*, A Treatise on the Diagnosis and Treatment of Dis. of the Chest, Part I., p. 532.

SUPPURATION.—See *arts.* Abscess and Inflammation, § 44, *et seq.*

SYCOSIS.—Synon.—*Sycoma; Sycon; Sycosis (from σῦκον, a fig); Mentagra; Ficus; Sycosis menti; S. barbæ; Mentigo; Varus Mentagra; Phyma Sycosis; Roscola ficosa; Dartre*

pustuleuse mentagre, Fr. *Barber's Itch; Chinwelk; Whelk.*

Classif.—IV. Class, IV. Order (*Author in Preface*).

1. Defin.—*A chronic pustular eruption, either scattered singly, or clustered, over the chin, upper lip, or lateral parts of the face; the pustules being pointed and seated chiefly in the hair-follicles and connected tissues, and being sometimes propagated by contagion.* (See *art.* Skin, § 78.)

2. i. Description.—This chronic eruption of the skin appears chiefly on the hairy parts of the face, and sometimes on the nape of the neck, and much resembles acne. It seems to be developed in the hair-follicles and sebaceous glands, and their connected tissues, giving rise to conical elevations, which become pustular. The pustules are generally traversed by the shaft of a hair; are of a pale yellow colour. Their evolution is usually attended by a sense of heat and tension of the affected parts. When *disseminated* they appear as very small red points, which gradually become more prominent, until about the third day, when their tops become white, and soon afterward are filled with a yellowish pus. These pustules seldom much surpass the size of a millet-seed. From the fifth to the seventh day each pustule bursts spontaneously; its sides shrink, and a slight oozing takes place, producing a brownish crust, which is very slightly adherent, and passes at its edges into the epidermic exfoliation from the inflamed surface immediately surrounding the pustule.

3. When the pustules are *clustered* or grouped in numbers, the inflammation then extends to the subjacent cellular tissue, and occasions small, hard, and red inflammatory tumours, covered with pustules, or incrustations of considerable thickness, and of a mixed yellowish and greenish-brown hue. Most frequently, sycosis appears, like rosacea, in repeated partial eruptions, succeeding each other at irregular intervals. When the pustules break out repeatedly on the same places, the inflammation of the subjacent tissue occasions indurations and thickenings, which, with similar changes in the corion, present the appearances of large tubercles. These are most frequently observed in aged, cachectic, or leucophlegmatic persons, in whom resolution of the pustular inflammation is imperfect. When the eruptions have been extensive, or have succeeded each other rapidly, these tubercles increase in number, and spread over the skin or other hairy parts of the face. The pustules which continue to be evolved on the surfaces of these tubercles, or in the intervals between them, evince the nature of the affection. This advanced state of the eruption—this admixture of pustules, tubercles, and incrustations—imparts a disgusting appearance; and at this stage, sycosis is always obstinate, a cure being never obtained but with great difficulty.

4. Sycosis may be confined to the upper lip; the agglomeration of pustules on this part occasioning a thick brownish or blackish scab, greatly elevated above the surface. When the disease is prolonged or extensive, the skin often becomes much altered by it, and so swollen in parts as to appear covered by moist and vegetating tumours. The bulbs of the beard often participate in the inflammation, and the hair falls out; but subsequently, when the disease is cured, lighter and weaker hair is reproduced, and acquires greater strength. In very chronic and severe cases, the loss of portions of the beard is permanent.

5. When the disease yields to treatment, new pustules cease to appear; the incrustations are detached, and the tubercles or small tumours decline in hardness and size. Slight desquamations occasionally take place from the points formerly affected, which continue for a long time red or livid, especially in cachectic habits and aged persons, and in these particularly the affected parts retain their thickened and tuberculated appearance through the rest of their lives.

6. The *duration* of this eruption is never less than one, two, or three months: it often continues for years, notwithstanding the most rational treatment; and is apt to recur, after having been cured, in persons of faulty constitution, in those advanced in age, and after errors in diet and regimen. The continuance or recurrence of the causes of the eruption tends also either to prolong or to reproduce it.

7. ii. Diagnosis.—The conical form of the pustular elevations, the bright red of the bases, the deep-seated connexion of the pustules, and the purplish and indolent tubercles which succeed them, are characteristic of this eruption, which, however, may be mistaken for acne, ecthyma, impetigo, boils, and syphilitic eruptions. The situation and the relations of the pustules of sycosis to the hair distinguish them from *acne*. The pustules of *ecthyma* are larger and more highly inflamed than those of sycosis. The scabs following ecthyma are also broader, thicker, and more adherent, and are unconnected with tubercular elevations and indurations. The small pustules of *impetigo figurata* hardly rise above the level of the surface, and are not pointed like those of sycosis; they also differ from the latter in the greater rapidity of their evolution, and the more acute symptoms attending their progress. Although both these pustular eruptions may be disposed in groups, those of sycosis are most frequently isolated and distinct, while those of impetigo *figurata* are generally clustered. The pustules of the latter burst on the third or fourth day, and the fluid from them is quickly changed into continuous yellowish incrustations, which increase in thickness in the course of a few days. Those of sycosis, on the contrary, do not burst until the fifth, sixth, or seventh day, and the scabs which succeed are thin, slight, and isolated. All these features are, however, obscured when the pustules of sycosis are copious and extensive, and give rise to a pale yellowish-green secretion, or when sycosis is severe and acute, and the pustules confluent or crowded; but even then the thickening, swelling, and induration of the subcutaneous cellular tissue and corion, imparting a tubercular character to the affected part, will prevent any mistake. In *furuncle* the inflammation commences in the cellular tissue and extends to the skin, much pus and a sloughy core being expelled through an opening which leaves a scar. But in sycosis the inflammation first affects the hair-follicles, and the pustules discharge only a small quantity of pus by a minute opening, which is speedily effaced without leaving a scar.

8. *Syphilitic pustules* very rarely are confined to the lower or hairy parts of the face. They most frequently appear on the ala of the nose, forehead, and near the angles of the mouth. They are much flatter than those of sycosis, and,

instead of arising from bright red bases, as the latter do, they spring from coppery, dirty, and almost flabby bases; and they are not preceded by the smarting or painful tension ushering the eruption of sycosis. The tubercles of sycosis may be more readily confounded with the tubercular syphilitic eruption; but those of the former are more conoidal, their bases are seated more deeply, while the syphilitic are more rounded, have a shining appearance, and are more superficial. They are, moreover, primary in their formation, while those of sycosis are consecutive of the pustules. The syphilitic eruptions are also preceded and attended by a variety of other morbid phenomena, which farther serve to distinguish them, as sore throat, inflammation of the conjunctivæ, nocturnal pains, &c.*

9. iii. The PROGNOSIS of sycosis is most uncertain; for it is impossible to state with certainty the period of its duration; and even when the decrease of the eruption and the appearance of the affected parts promise a speedy cure, fresh pustules often break out, without any apparent cause. In other cases, when the extent and severity of the eruption lead to the expectation that the disease will prove most obstinate, an active and judicious treatment may remove it in a comparatively short time. M. RAYER considers that those cases generally prove the most rebellious which, in the chronic state, preserve the pustular and primitive form.

10. iv. CAUSES. — The contagious nature of sycosis has been contended for by some writers, and denied by others. PLINY states that the disease, which he described by the name of *Mentagra*, spread in Italy by contagion. If this disease was actually not sycosis, it was very closely allied to it. M. FOVILLE states that he has seen several of the insane patients in the hospital of Rouen successively attacked with this affection from having been shaved with the same razor. Admitting the disease to be contagious, circumstances cannot often favour such an occurrence, especially in such a manner as will demonstratively manifest the fact. Sycosis most frequently appears in adult males (very rarely in females) of a sanguine or bilious temperament, who have thick and strong beards; and occasionally among the aged, more especially among those who have been habitually used to strong heats, as cooks, founders, refiners, and workers in glass and metals. The abuse of spirituous liquors, indulgence in the luxuries of the table and highly-seasoned food, and similar causes, have been supposed to occasion it; but these may more rationally be considered as causes which concur to perpetuate it, or to render it more remarkably chronic, than to originally produce it. The want of due cleanliness, irritating applications to, or rancid matters allowed to remain in contact with the parts affected, the use of a foul, or blunt, or rough-edged razor, are much more likely to excite this eruption than those other causes to which it has been sometimes imputed. It appears more frequently in spring and autumn than at other seasons.

11. Dr. GRUBY, of Vienna, has lately contended that favus is occasioned by a vegetable formation, and that such a formation, of the cryptogamic kind, is found in the roots of the hair of the beard in this affection, and around that portion which is contained in the hair-follicle. The seeds of this vegetable formation, for which he proposes the name of *mentagrophite*, he believes to be the source of the contagious nature of the disease. On examining this affection with the microscope, the scales appear to be composed of epidermic cells, but the whole of the dermic portion of the hair is surrounded by cryptogamic formations, which constitute a vegetable sheath around it, in such manner that the hair may be likened to the finger surrounded by a glove. These cryptogamia never rise above the surface of the epidermis: they originate in the matrix of the hair and in the cells of which the follicle is composed, and they ascend so as to surround all that portion of the hair included within the dermis. "They present every where a prodigious number of sporules, which are adherent on the one side with the internal surface of the follicle, and on the other with the cylinder of the hair; to the former they are very closely connected. Each plant is composed of a stem of several branches, and of sporules."

12. v. TREATMENT.—The causes, both exciting and concurring, should be removed, and the hair cut close with curved scissors, particularly if the use of the razor aggravate the affection. In some cases an emetic will be given with advantage, but it should be followed by stomachic purgatives. If the local inflammation be considerable, leeches may be applied; and if the patient be plethoric, a general blood-letting may precede them. Local emollient applications should be first employed, and these ought to be followed, especially as the disease becomes chronic, by applications which contain the chloride or iodide, or the proto-nitrate of mercury, in the form either of ointment or lotion. Ointments containing the iodide of sulphur, or the iodide of potash and sulphur, or even sulphur only, are most successful, especially when emollient applications, or vapour douches, or warm-water douches, are used in the intervals between the employment of these ointments. In some cases a restorative or tonic constitutional treatment is required, and alterative mineral springs and waters are often of service. The hair, especially when it becomes loose, should be removed from the seat of eruption; and if the affection become very chronic and obstinate, the application of the mineral acids, or of the caustic alkali, or the nitrate of silver, or even of the chloride of zinc, may severally be tried. Great care should be taken in this affection, as well as in others for which ointment may be required, that they are recently made. In a case to which I was lately called, the zinc ointment was prescribed after the

*["The chronic miasm which we designate by the term *Sycosis*," says HAHNEMANN (*Chronic Diseases*, translated by HEMPEL, vol. i., p. 111), "has only prevailed from time to time, and has given origin to the smallest number of chronic diseases. *Sycosis* was especially spread in Germany, between the years 1809 and 1814, during the war with France; ever since then the disease has been decreasing. Sycosis, being supposed to be homogeneous with syphilis, has heretofore been treated with mercury internally, and externally by cauterization, burning, cutting, or ligatures." HAHNEMANN confounds sycosis with syphilis. "Both the gonorrhœa and the excrescences of sycosis," says HAHNEMANN, "are cured in the most thorough and durable manner by the internal administration of a few globules of the decillion preparation of Thuya (*arbor vitæ*), which ought to be allowed to act for the space of fifteen, twenty, thirty, or forty days! After this lapse of time, you give an equally small dose of nitric acid, letting it act during an equally long period. These two remedies are sufficient to cure both the gonorrhœa and the excrescences of sycosis." The above will serve to show sufficiently both the diagnostic and therapeutic skill of the father of Homeopathy.]

use of emollient applications, and was found quite rancid and most injurious *at five different chemists'* in the outskirts of the town where it was had; but when this ointment was procured from a respectable chemist in town, it was quite successful.

[In the treatment of sycosis we have chiefly depended on the repeated application of leeches behind the ears or under the jaw, where the eruption was abundant and the inflammation violent, local emollients, an antiphlogistic regimen, and the preparations of iodine and iron as internal alteratives. Acidity of the stomach and the secretions generally is to be cautiously guarded against by a regulated diet, cutaneous frictions and the shower bath, and the use of alkalies. Douches of simple steam frequently applied to the diseased part will often accomplish a cure. We are not much in favour of caustic applications, as the nitrate of silver. Mercury, as an alterative, in very minute doses, will sometimes succeed, if the other measures are employed at the same time. M. Biett, of the Hospital St. Louis (Paris), cured many cases by the internal use of the *muriate of gold*, used in doses of one third to half a grain, by frictions on the tongue. All alcoholic stimulants and exposure to fire are to be avoided.]

Bibliog. and Ref.—*Celsus*, De re Medica, L. vi., cap. iii. — *Plinii Secundi*, Natur. Hist., L. xxvi., cap. i.-iv. — *Ætius*, Tetrab., i., serm. 5, cap. 80, 190.—*Pauli Æginetæ*, lib. ii., cap. 22.—*C. Johrenius*, De Mentagra, 4to. Franc., 1662. — See the Works of *Willan*, *Bateman*, *Rayer*, *Plumbe*, *E. Wilson*, and others, referred to in the several Articles on Chronic Cutaneous Affections, and especially in that on the *Pathology of the Skin*.

SYMPATHY AND SYMPATHETIC ASSOCIATIONS OF DISORDER. — Synon. — Morbid Sympathies.—Συμπαθια or συμπαθεια, (from συν, with; and παθεω, I feel or suffer; or παθος, feeling, affection, suffering); *Sympathia*, Lat. *Consensus nervorum; Partium Consentio*, Auct. *Die Mitempfindung*, *Sympathie*, Germ. *Sympathie*, Fr. *Simpatia*, Ital. *Morbid Sympathies*.

Classif.—Physiological Pathology—General Pathology—Semeiology.

1. Definit.—Sympathy cannot be more correctly defined than it has been by Dr. Klein Grant, as follows: "*That relation of the organs and parts of a living body to each other whereby an action excited in one part induces a corresponding action in another part.*"

2. Baglivi attributed the sympathies to membranous connexion, Bordeu to the cellular tissue, Willis and Vieusens to the agency of the nerves, and Whytt and Broussais chiefly to the brain. Rega divided the sympathies into those of sensibility and those of contractility—a division which has much to recommend it. Bichat made some excellent observations on the relations subsisting between the sympathies and the different parts of the nervous system; but, although these observations were calculated to lead to a more correct arrangement of the sympathies than had formerly been offered, they have not yet produced this result. The writings of Unzer, far in advance of their age, had previously furnished much that was calculated to increase our knowledge of sympathetic phenomena; but this was physiological rather than pathological, and without sufficient practical application. Bichat appears to have been ignorant of the works of Unzer. Contemporaneously with the former, Prochaska examined physiologically sympathetic phenomena, when treating of the sensorium commune and the consensus nervorum, in his treatise on the Functions of the Nervous System; and while he recognised what had been done by Willis, Whytt, Stahl, Unzer, and others, explained the phenomena by means of the sensorium commune, to which he referred the consensus nervorum.

3. In 1824, I defined sympathy to be, *that state of an organ or texture having a certain relation to the condition of another organ or texture, in health and disease*; or, *a related state of the vital manifestations or actions in different organs or textures, as, when one part is excited or affected, others are likewise affected or disordered.* I then classed sympathies into the *reflex* and the *direct*; the former taking place through the instrumentality of the sensorium, the latter being independent of it, and occurring through means of the ganglial nerves, and chiefly of those which form communicating cords between the viscera and of those which are distributed to the blood-vessels.

4. Subsequently, Dr. M. Hall referred many of the phenomena usually ascribed to sympathy, especially those which I denominated reflex, to a reflex function of the spinal cord, which function he considered to occur independently of the brain, or even of the sensorium, that is, supposing the sensorium to be seated in the brain. But that the sensorium commune is actually seated only in the brain, has been, and still is, doubted. Willis considered that there is a rational and a corporeal sensorium, and Unzer long subsequently adopted the same idea, or nearly the same idea, which was more fully developed and modified by Prochaska. This last writer subdivided this principle into two elements—namely, the sensorium commune of the soul, which is seated in the brain only, and reflects those impressions of which we are conscious, and the sensorium commune of the body, which is seated in the brain, spinal cord and ganglia, and plexuses of the sympathetic system. But, wherever seated, there is evidently only one sensorium commune, which takes cognizance of impressions, and reflects them to distant parts, or, by means of which impressions, movements, &c., become sensations, or objects of consciousness or sentient operations, whether lively or faint, thereby constituting the class of reflex sympathies attended by consciousness. That this great principle may be seated in the basilar or central parts of the brain and medulla oblongata is very probable, but that it extends also to other or more distant parts, and is independent of these centres of conscious or sentient actions, is not so admissible; for it is more reasonable to infer that those movements or actions which are unattended by consciousness may be the results of a direct consensus of nervous action, or of a reflected consensus from ganglial or subordinate nervous centres, that either is not conveyed to, or does not reach the seat of conscious sensation, or which, owing to the state of this principle, or of its seat, fails to excite, rouse, or affect it.

5. It is obvious that, if we attempt to arrange those sympathies which depend upon a consensus of the nerves, the classification must be made either independently of any reference to consciousness, or with so strict a regard to this principle as to assign to it a higher attribute than that which a simple nerve-action involves. If,

however, we neglect such reference, any arrangement of nervous sympathies must be imperfect; and if we pay due regard to it, the difficulty of classification is greatly increased, seeing that the simplest and most direct consensus, such as those which concern the ganglial nerves, and which ordinarily occur independent of sensation, may become objects of the most intense sensation, the same change also taking place in respect of reflected sympathies, which may or may not be attended by consciousness, according to the intensity of the cause producing them, or to the state of the sensorium or of its seat. Hence it may be preferable to arrange sympathies with reference to the superadded attribute of consciousness, but not to assign an order of sympathies alone manifesting this attribute or principle, seeing that there are few or no nervous sympathies which may not, by intensity or otherwise, be attended by it, or excite it. Conformably with this view, therefore, I have offered the following arrangement, which I have more fully developed in the sequel: 1st, *direct sympathies*, transmitted directly, either by nervous communications or by continuity of structure, &c.; 2d, *indirect or mediate sympathies*, conveyed by vascular communication, by states of the fluids, &c.; 3d, *reflected sympathies*, occurring through the media of the several orders of the nervous system, with or without consciousness.

6. From the time of Willis until those of Unzer and Prochaska, sympathy and consensus of the nerves were generally viewed as synonymous; and this consensus being supposed to depend upon the sensorium, it became a great difficulty to explain how this consensus took place with consciousness in some cases, and without consciousness in others. It was therefore inferred that the consensus which involves this principle takes place in the brain, and excites or impresses the mind or soul; and that the consensus which fails of impressing the mind is seated throughout the frame in the several parts of the nervous system; the former being the mental consensus, and depending upon a mental or soul sensorium, the latter being a corporeal consensus, and depending upon a bodily sensorium. Thus these physiologists divided the sensorium into two essences or manifestations, the one with, and the other without consciousness, the latter, however, being only nerve action, or the vital manifestations of the nervous system, which are unattended by consciousness, and which constitute an important, indeed the most extensive and important part of those phenomena, which are comprised under the head of morbid sympathies.

7. The subject cannot be better illustrated, nor the observations I intend to offer on sympathy better introduced, than by adducing the remarks of Prochaska respecting it; and these cannot be more clearly conveyed than in the words of Dr. Laycock, who has most ably translated and edited the dissertation of this writer on the Nervous System for the *Sydenham Society*. "That point of the nervous system is termed the common sensorium (*sensorium commune*), in which external impressions meet, and from which internal impressions are diffused to all parts of our body; in which, consequently, the consensus of the nerves takes place that is necessary to life, and in which external impressions are reflected into internal impressions, according to the law of self-conservation, with or without consciousness.

8. "That sensorium in which impressions are reflected with the consciousness of the soul, may be termed the soul sensorium; and the other, the corporeal sensorium; just as Willis has already divided it into the rational and the corporeal soul.

9. "The brain only is the seat of the soul sensorium; the seat of the body sensorium is the brain, spinal cord, and (as all observation shows) the ganglia and plexuses of the nerves. That external impressions can also be reflected in the brain, without consciousness, is shown by the involuntary convulsions of voluntary muscles. Monsters, born without brain and spinal cord, and which live up to the moment of birth, show that the consensus of the nerves necessary to this form of life, imperfect though it be, may take place, and that there may be a corporeal sensorium independently of the brain and spinal cord, and which, consequently, must be constituted by the plexuses and ganglia of the nerves. The movements observed to take place on irritating the nerves of a headless frog, and seen also in decapitated men, prove the same thing. The sympathetic nerve appears likewise to reflect its impressions in its ganglia and plexuses without the consciousness of the soul.

10. "In accordance with this consensus of the nerves, as well in the brain as in the spinal cord, ganglia, and plexuses, the operation of a stimulus is not limited to the nerves immediately irritated, but is extended to distant nerves, in known or unknown connexion with the irritated nerves; and this is demonstrated by innumerable examples of consensus of nerves (consensus nervorum), as, for instance, the irritation in the pregnant uterus often causes nausea, vomiting, headache, toothache, &c.

11. "Both the soul sensorium and body sensorium operate according to the law of self-conservation, a truth which may be illustrated by numerous examples. For instance, the irritation or impression of too strong a light goes to the optic nerve, from whence it can only get at the ciliary nerves through the brain, and induce contraction of the pupil, so as to exclude the too vivid light from the eye, and obviate its unpleasant impression."

12. By most writers, the term consensus nervorum has been viewed as synonymous with those nervous sympathies which occur in healthy persons, or which are not essentially morbid; while sympathy, according to its etymology, is considered by many as applicable only to associated morbid phenomena. The word *sympathy* has been viewed in both lights, and however correct the one may be, the other being the reverse, I shall respect common usage as regards it, and, in order to prevent any misapprehension, use frequently the prefix *morbid*, when discussing its numerous manifestations.

13. In attempting to illustrate *morbid sympathies, or those associated states of disorder which most frequently present themselves to the physician*, I shall first endeavour to classify them, conformably with the view above stated (§ 5, 12); and afterward proceed to notice those which come more prominently before the medical practitioner, as fully as the plan and limits of my undertaking will permit. Many topics can be only briefly and imperfectly considered, while others may be barely enumerated, and offered to the reader, or to fu-

ture inquirers, more fully to discuss or to illustrate.

14. Arrangement of Morbid Sympathies or Associated Disorders.

i. Definition of sympathies.

ii. Preliminary anatomical physiological observations.

A. The great extent and importance of the ganglial or the organic nervous system.

B. The connexions subsisting between the organic and cerebro-spinal nervous systems.

I. Inquiry into the Media by which Sympathetic and Symptomatic Phenomena are evolved, and Morbid Conditions are associated.

i. *Direct or immediate sympathies.*

A. Direct communications by means of ganglial nerves.

B. Influence of ganglia on different organs or parts.

C. By direct communications by means of the cerebro-spinal nerves of sense and motion.

D. By continuity of surface or tissue.

E. By contiguity of organs and structure.

ii. *Indirect or mediate sympathies.*

A. By vascular communications.

B. By states of the circulating fluids.

a. The chyle and other absorbed fluids.

b. The blood.

C. Owing to the conditions of the secretions and excretions.

a. By the various secretions.

b. By the excretions.

iii. *Reflected sympathies.*

A. Reflected from nervous ganglia, often attended by spasm and altered sensibility of involuntary parts.

B. Reflected through the media of the ganglionated roots of the spinal nerves, and affecting the movements of voluntary parts.

C. Reflected through the medium of the spinal cord, and inducing morbid sensations or motions, or both.

D. Reflected through either the medulla oblongata or the brain, or both, and causing various disorders of sensation, of perception, and voluntary action, &c.

II. Circumstances influencing the Character, Number, and Intensity of Sympathetic Phenomena.

i. *Race and temperament.*

ii. *Habit of body.*

iii. *Sex.*

iv. *Age.*

v. *Physical power.*

vi. *Occupations*, &c.

III. Classification of Morbid Sympathies, or of Symptomatic or Associated Disorders.

i. Associated Affections of Digestion and Assimilation.

A. Disordered states of digestion and of assimilation associated with each other.

a. Associated disorders of the stomach and liver.

b. Associated disorders of the liver with the intestines.

B. Morbid sympathies between the digestive organs, and the secreting and excreting functions.

a. Between the functions of digestion and the urinary functions.

b. Between the digestive functions and the skin.

c. Between the functions of digestion and fæcation.

C. Sympathies between the digestive and circulating and respiratory functions.

D. The sympathetic and symptomatic relations between the digestive organs, the brain, and the organ of sense.

E. Sympathies between the functions of digestion and locomotion.

F. Associated disorders of the digestive and the sexual organs.

ii. Sympathetic and Symptomatic Phenomena connected with the Circulating and Respiratory Functions.

A. Mutual influences of these functions.

a. From nervous connexions.

b. From the nature of the functions themselves.

c. From their actions on, and the reactions of the blood.

d. From physical agents acting on the blood and on the respiratory and circulating organs.

e. From mechanical and other impediments to the circulating apparatus.

f. Influences of these functions, and their symptomatic relations in acute diseases.

g. Symptomatic relations of these functions in chronic diseases.

B. Morbid sympathies of the circulatory and respiratory functions with the digestive functions.

C. Sympathy between the vascular and respiratory functions, and the brain and organs of sense.

D. Associated morbid states of circulation, secretion, and excretion.

E. Association of disordered excreting function, with disorder of the vascular, nervous, and muscular systems.

iii. Associated States of Disordered Sensation and Sensibility.

A. Sympathetic and symptomatic states of the several senses.

a. With the organic functions.

b. With states of the cerebro-spinal centres.

c. With the reproductive organs.

iv. Associated Affections of Voluntary Motion.

A. Sympathy between the functions of sense and locomotion.

B. Associations of mental emotion and locomotion.

a. Arising from the exciting emotions.

b. From depressing emotions.

C. Sympathies between organic and animal or voluntary motions.

a. Organic or involuntary motions extending to voluntary muscles or organs, and rendering the actions of these involuntary.

b. Voluntary motions affecting the organic or involuntary actions.

c. Associations of the organic and voluntary motions in the functions of reproduction.

v. Sympathies of the Organs of Reproduction.

A. Sympathies between these and the digestive and assimilative functions.

B. Between the several organs and the cerebro-spinal functions.

a. Between these organs and the brain.

b. Between these and the spinal cord and voluntary organs.

C. Between these organs and the functions of sense and general sensibility.

vi. Concluding Remarks.—As to the importance of observing closely sympathetic and symptomatic phenomena, and of tracing their origins and relations, with reference not merely to diagnosis, but also to prognosis and treatment.

15. A due recognition of morbid sympathies, or of those associated states of disorder which most frequently present themselves in practice, of the media of their connexion, of the modes of their supervention, and of their extent, is of the greatest importance to the physician in enabling him to form a correct diagnosis and prognosis in most of the diseases which come before him, and to arrive at rational indications of cure.

16. i. Definition. — *Morbid sympathies may be defined to be associated states of disordered function, or of diseased action; the disorder or disease of one system, or organ, or part, affecting other systems, organs, or parts, according to their organic connexions, their functional relations, and their several tendencies, or acquired or constitutional predispositions; the consecutive sympathetic disturbance often being more prominently manifested than the original or efficient morbid condition, and thereby frequently concealing or masking this condition.*

17. ii. Preliminary Observations. — It is necessary to a due consideration of this subject, that, before I proceed to notice the more remarkable morbid associations occasionally presenting themselves in practice, I should take *an anatomico-physiological view of the media or channels by which one organ or part sympathizes with, or becomes affected by, the morbid conditions of another organ or part.*

18. The modes of explaining these morbid associations or sympathies, adopted by previous writers, are various and unsatisfactory, and have been generally based upon the prevalent doctrines of the day; consequently the recognition of sympathetic, symptomatic, or associated morbid states has been imperfect, the classification of them arbitrary or conventional, and the chains of connexion existing between them imperfectly or erroneously traced.

19. Dismissing, therefore, all reference to the few writers who have considered the subject, I shall view it conformably with the inferences at which I have arrived, from researches which have engaged my attention on various occasions during the last thirty years.* But I can only imperfectly accomplish my intention within the limits to which I am confined, and must merely touch on certain points, which, to do them justice, would require a much more extensive elucidation.

20. *A.* There are certain circumstances in the *anatomy of the organic nervous system*, which, when kept in recollection, serve remarkably to explain many phenomena hitherto imperfectly accounted for. Much difficulty and misapprehension, in tracing the connexion of the sympathetic or associated morbid states, have arisen from the usual modes of viewing the large nervous masses, as giving origin to the nerves, or as being themselves a congeries of ganglia of a peculiar constitution. It would be much more conformable with a comprehensive view of the nervous system through the various grades of animal organization, and with the development of this system in the more perfect animals, if the nerves, and especially the sensory and those of organic life, or ganglial nerves, were viewed as originating in the several tissues or structures themselves, more particularly in the organs of sense, in the cutaneous and mucous membranes, in the serous and fibrous tissues, &c. This idea, entertained and published by me many years ago, subsequent observations and reflections have tended to confirm.

21. Another important circumstance, one which I have also insisted upon for many years, which was formerly disbelieved, but is now fully confirmed by recent researches—namely, that all secreting organs are supplied with organic or ganglial nerves. The modes in which the viscera, both abdominal and thoracic, are supplied, are well known — namely, *first*, by fibres proceeding from numerous ganglia and plexuses, or, according to the view just stated, by fibres originating in the organic or ganglial corpuscles, which, by microscopic aid, have been detected not only in the softer ganglia and nerves themselves, but also through the muscular tissue, the skin, the serous and the mucous surfaces; or, in other words, from fibrils originating in organic or ganglial corpuscles, and proceeding centripetally to form plexuses or ganglia in the various abdominal, thoracic, and pelvic viscera. *Second*, by the organic or ganglial fibrils interlacing and surrounding the coats of arteries. As far back as Winslow, the soft or ganglial nerves were traced in the large arteries, and he represented them as forming a net-work around these arteries. In 1816, 1817, and 1819, this subject engaged my attention; and I was enabled by the microscopes then in use, which were of weak power, to trace the ganglial nerves, when the parts had been macerated for a short time in spirits of turpentine or spirits of wine, or diluted acetic acid, as far down as the lower third of the femoral artery; and my more recent researches have shown that numerous fibres proceed from the sympathetic ganglia to the gangliated roots of the spinal nerves, and thence are ramified, on the one hand, to the cord itself, and on the other, along with the spinal nerves, to the extremities and general surface. When they reach the extremities, especially near the surface, and in the vicinity of the several joints, and even as low as the ankles and wrists, they become intimately associated with sensory nerves, forming, with them, small or minute ganglia, and supplying with minute fibrils the synovial surfaces. The obvious intentions of this organization may be inferred to be, 1st, that the sensory function and the ganglial functions should be associated; and, 2d, the vessels furnishing the secretion to the synovial surface shall be re-enforced by organic nervous energy, for the promotion of synovial secretion. The communications of the ganglial nerves with the sensory nerves and spinal cord, the numerous branches proceeding from the splanchnic ganglia to the sympathetics, and thence to the ganglionated roots of the spinal

* I should not now have here entered so fully as I have done on the present inquiry; but certain views comprised by it engaged much of my attention, and not a little of my time, many years ago. And when they were first published (in 1822 and 1824), they were considered by many as heterodox and visionary. They have, however, received support from the more recent researches of several eminent inquirers; and they alone of existing doctrines are capable of accounting for the *sympathies or associations of morbid function and action*, although so succinctly and imperfectly considered in this article.

cord, and to the cord itself, explain many of the phenomena remarked in the course of diseases of the abdominal viscera, on the one hand, and of diseases of the spine, spinal cord, and joints on the other. When diseases of the joint go on so far as to produce disorganization of the parts, we commonly find that the digestive organs sympathize more or less with them, so that loss of appetite, and even vomiting, not unfrequently supervene.*

22. I have elsewhere contended that the nerves supplying the synovial and mucous surfaces and integuments should be viewed as originating in the nervous corpuscles distributed to these parts; or, in other words, that delicate fibrils arise in, and are connected with, these corpuscles, coalesce in the extremities with the sensitive fibres, form minute ganglia with these latter, and run thence, or rather converge, towards the spino-cerebral axis. Thus, while the *splanchnic and sensitive nerves* may be viewed as arising in, or commencing from, the nervous corpuscles already noticed as existing in the several surfaces, viscera, and organs, and as interlacing or communicating freely with each other, and with nerves of motion, as well as supplying the circulating systems, the *motory nerves* proceed in an opposite direction. The *former converge* towards the centre, communicating with the encephalon and nerves of sense; the *latter diverge* from the spinal centre to the periphery, also communicating with the brain, from which proceed the impulses of volition by which they are influenced. The *one* class is acted upon by mental impressions or volition; the *other*, by physical causes or agents.

23. The nerves may thus be divided into *three classes*, namely, 1st, the splanchnic or visceral, or those of digestion, assimilation, circulation, and secretion; 2d, those of general and special sensation; and, 3d, those of volition, or muscular action or motion.

24. *B.* But it is important to bear in mind *the character of the communication between these orders of nerves*, inasmuch as such communications give rise to numerous states of healthy or morbid action, and occasion, mutually, various affections of the large or nervous centres. The connexions between the organic nerves and the roots of the spinal nerves, and the nerves of sensation, have not been investigated till recently, and even now not so fully as is required. This much, however, may be remarked generally, that the organic or ganglial nerves are more or less connected with all the nerves of sensation; and where the connexion is formed, or where these different nerves closely approach each other, we generally find minute ganglia.

25. It has been a subject of discussion, viewing the brain as the secreting organ, as it were, of the manifestations of the mind, how the brain itself is supplied with organic or ganglial nerves. We know that the vessels of the brain, the carotids and other arteries, are all surrounded by ganglial or soft nerves; still, this is an insufficient supply of these nerves, if we consider the analogy existing between this organ and the other organs of the body — if we view the brain to be like other viscera; inasmuch as we find in other viscera, that, beside the ganglial nerves, thus distributed to the blood-vessels, there are also special ganglia, which are intended for the farther supply of nervous energy to them. Take, for instance, the liver; there are, besides the organic or soft nerves supplying the blood-vessels, several ganglia and plexuses supplying the structure of the viscus itself. Take the kidneys; there are also specific ganglia devoted to the maintenance of a certain and constant amount of nervous energy, probably modified in kind, or suited to the functions of these organs. It is not, however, so manifest that the brain enjoys a similar supply of ganglia and ganglial nerves, or that the supply of these nerves, furnished through the medium of the blood-vessels, is at all sufficient for the several functions or manifestations of the brain, viewing these functions as depending upon the organic nervous ganglia and ganglial ramifications, as observed in respect of secreting viscera and organs. Hitherto the sufficiency of the supply of ganglial nerves sent to the brain with the blood-vessels has not been demonstrated, and hardly admitted; and special sources of such supply, as exist in connexion with the other viscera, have not been satisfactorily shown, granting that the organic nerves supplying the blood-vessels of the brain are insufficient for the discharge of the functions of this organ.

26. It has been considered, and most probably with truth—indeed, I have on several occasions contended—that the pituitary and the pineal bodies are, in fact, organic nervous ganglia, inasmuch as there are communicating branches or fibrils running between the other ganglia, at the neck and about the base of the skull, and these bodies. But, in opposition to this view, it has been argued that these bodies are different from other ganglia in the body. However, as all the ganglia may be considered to have a minute special organization, according to the functions to be performed by the organ which they supply, and as the functions of the brain are so very different from those of other parts of the body, so may the ganglia distributing their prolongations and fibres to this organ be reasonably considered to differ

*[The composition of the ganglionic or sympathetic nerves is essentially similar to that of the cerebro-spinal nerves; consisting of a series of nerve-fibres bound together by areolar tissue, which forms their neurilemma. This sheath is, however, denser than in the cerebro-spinal nerves, so that the nerve-fibres are more difficult of separation, and the fasciculated character is not so obvious. It consists almost entirely of white fibrous tissue, longitudinally disposed, which are crossed by some fine circular fibres of yellow tissue, surrounding the nerves at various distances from each other. When a nerve is torn up by needles, and treated by acetic acid, numerous small oval cell-nuclei are seen lying in and among the fibres, with their long axes parallel to the latter.

It is a significant fact that the sympathetic nerves contain the fibres of both kinds, the tubular and the gelatinous, in very variable quantity in different nerves; the former being numerous in the ramifications of the solar plexus and in the cardial nerves; the latter almost exclusively composing one of the fascicles by which the sympathetic communicates with the spinal nerves. The frequent formation of ganglia in the course of their trunks, and of their ramifications, constitutes also a remarkable feature. The branches, as stated by our author, and as demonstrated by Scarpa, attach themselves to the exterior of arteries, forming very intricate plexuses, which entwine around them. Along these vessels the nerves are conveyed to the tissues; but of the mode in which their filaments connect themselves immediately with those textures we are at present entirely ignorant. Todd and Bowman believe that the ramifications of the sympathetic are limited to the trunk and head, and that it has probably little or no connexion with the extremities. Its connexion with the brain and spinal cord takes place through the cerebro-spinal nerves, certain filaments connecting each spinal nerve to some portion of the ganglionic chain, which lies on each side of the spinal column; while a similar connexion takes place between ganglia of the cephalic portion of the sympathetic and the encephalic nerves.]

also from others. These bodies are connected likewise with the soft commissures and gray substance of the brain. In fact, these bodies, like the ganglia, as well as the gray substance of the brain and spinal cord, which are the active portions of these organs, abound with organic nervous corpuscles; and they are connected, by means of delicate gray fibrils, with the plexuses surrounding the arteries, and with the ganglia in the head, especially with the ganglia of Ribes, Cloquet, and Meckel. The difficulty has been to trace this connexion; and unless it be admitted that these bodies are, in fact, ganglia, devoted to the office of supplying vital energy to the brain, to enable this organ to discharge its functions, we are at a loss to account for their functions. These bodies are lodged more securely than other parts from danger; they are placed near the base of the brain, and in situations the least likely to suffer from injury; and they are in connexion with the commissures of the brain, where it is believed the functions of volition connect themselves with those of perception and intellect.

27. Although it is difficult to trace the connexions of the ganglial nerves with the brain and the nerves of special sense, it is not so difficult to ascertain the connexion of the ganglial nerves with the spinal cord and spinal nerves. The spinal nerves, especially those of volition, are all white and tubular, and are not provided with the organic nervous corpuscles seen in the ganglia and their nerves; while the latter are soft, gray, and ramify in an irregular and indeterminate manner, compared with the former. Now the ganglial or gray nerves, as already stated, may be traced from the sympathetics into the gangliated roots of the spinal nerves, and fibrils proceed thence to the cord itself, while others may be traced in an opposite direction, or from these roots, along with the spinal nerves, to the extremities and surface of the body.* On the other hand, ramifications of the white or spinal nerves run to the ganglia of the sympathetic nerves, and in some situations, especially in the pelvis, may be traced into the splanchnic ganglia. Thus there are, 1st, communicating branches of gray nerves running from the ganglial system to the spinal roots and cord; and, 2d, communicating branches of white or spinal nerves proceeding from the cord to the sympathetic and ganglia. Hence the functions of each department of the nervous system are mutually aided; and impressions made upon one part of either system are extended in a more or less sensible manner to other parts.

28. The ganglia placed on or near the pelvic viscera admit of the clear recognition not only of the intimate structure of the splanchnic ganglia, but also of the presence of white nerves, which either terminate in them or proceed through them, and which come in greater numbers, or more palpably, from the spinal cord to them, than to any other ganglia. Thus the generative and urinary organs are supplied not only with ganglial or splanchnic nerves, but also with spinal nerves, a supply of nerves from both nervous systems being necessary to the due discharge of their functions; and the supply of each of these different orders of nerves to each of these organs is in due relation to the functions which each discharges. Thus, also, the generative organs are supplied not only with the organic nervous influence, but also with the nervous influence generated by the brain and spinal cord. And, moreover, the special ganglia devoted to these organs are mutually connected by means of communicating branches, both with the other splanchnic ganglia and with the cerebro-spinal axis.

29. I have been thus particular in directing attention to the communications between the different systems of nerves, because we are thereby enabled to explain many phenomena which occur in the course of disease. It may be, therefore, inferred, in brief, that these different orders of nerves communicate mutually by means of branches going from one to the other; and generally ganglia or plexuses are formed at or near the points of communication. There thus arises an interchange of influence, tending to the proper discharge of function; and mutual sympathy is developed when an impression is made on any one part of the circle formed by this communication and organic connexion, the effects varying with the nature of the impression.

30. *C.* It is impossible to arrive at just conclusions as to the sympathy or mutual dependence of parts without reference to *the vital property of irritability*, and the relations of this property with the nervous system. Almost up to the present day, especially from the days of Haller, irritability was considered as a function of the muscular fibre—as a *vis insita* in that fibre, and not dependent upon the nervous system. Many years ago (in 1819, 1820, and 1821), I directed particular attention to the subject of irritability of different structures, and tried many experiments, especially in some of the lower animals; and from these experiments and observations, I then came to the conclusion that the irritability of fibrous and muscular parts depends upon the organic nervous system; and much more recently, this doctrine was advocated by Dr. Fletcher, in his works on Physiology, he making a due acknowledgment to me as having originated it.

31. In the first place, all irritable fibres present, when under the microscope, a more or less abundant supply of those corpuscles in which organic nerves may be said to originate, and, in fact, from which the organic nervous fibres have been detected by the microscope to take their origin—from which they arise or proceed, and with which they abound. The involuntary muscles, and the fibrous membranes of the hollow or tubular viscera, are supplied only with soft nerves—have no other nerves than ganglial; and they possess great power of contraction, both in health and disease. This power may be traced, to a certain extent, even in the membranous portion of the trachea and bronchi; and if we refer to the comparative anatomy of these parts, especially to the trachea of some of the higher animals, we find a singular conformation of the cartilaginous rings, remarkably well calculated to antagonize the contractile force of the fibrous structure of the membranous portion of the tube. These rings are, indeed, the antagonists of the contractile power of the fibrous structure, preserving at the same time a patent state of these tubes, and admitting of a certain degree of contraction when

* ["The ramifications of the sympathetic nerve," say Todd and Bowman, "seem to be limited to the trunk and head. It has probably no connexion, or at most a very limited one, with the extremities."—(*Physiological Anat. of Man*, p. 223.)]

this structure, or the soft nerves supplying it, are irritated. This conformation is very remarkable in ruminating animals, and well calculated to prevent the tracheal canal from being diminished or injuriously pressed upon during deglutition and rumination.

32. Although involuntary fibrous structures are supplied only with organic or soft nerves, and notwithstanding that the structures receive no white or voluntary nerves, nevertheless they are impressed or acted upon by the electro-galvanic influence. In 1820 and 1821, I instituted some experiments to determine the contractility of fibrous membranes, but the galvanic agency did not appear to produce much effect unless the power was very considerable. When, however, this agent is applied to the nerves of motion proceeding to voluntary muscles, the effect is very remarkable. It would appear that the voluntary muscles are supplied with voluntary or spinal nerves in addition to the supply of soft nerves received or possessed by all fibrous structures, bestowing thereby upon these muscles a voluntary and a greater power of contraction; the power and character of contraction thus varying with the nature and conformation of the muscular parts, and with the nervous centres which supply these parts with nerves. I can scarcely follow this subject farther, inasmuch as I have to notice other topics that will occupy much of my limits; but it is more fully discussed in my notes to RICHERAND'S *Elements of Physiology*, and in the articles "IRRITATION" and "IRRITABILITY." I have there contended that irritability depends on the organic or ganglial nervous system, and that it is exalted in the voluntary muscles by the terminations of the motor or voluntary nerves.

33. The irritability of the heart is very remarkable. I have had opportunities of investigating it in the hearts of a number of animals, and in several fishes—the halibut, the skate, the turbot, the cod, ling, &c. From all these the heart may be cut out, and it will still contract for a short time after it has been separated from all nervous and vascular connexions; thus showing that not only does it take a considerable time for the influence of the ganglial nerves supplying an involuntary organ to be exhausted, but that the numerous plexuses and small ganglia, formed by these soft nerves under the serous linings and in the structure of the heart itself, and in the vicinity of blood-vessels, still continue to supply nervous power to the muscular structure, and are of themselves sufficient for the continuance of the phenomena of irritability for a short time. Moreover, the heart appears to be plentifully supplied in its structure with those ganglionic corpuscles which, as I have already stated, are intimately and organically connected with the soft, gray, or ganglial nerves, and which most probably also administer to its irritability. Owing to these provisions, a short period is required to exhaust the irritability of the organ, even when thus isolated or removed from all its connexions. It is not surprising, therefore, when viewing the morbid relations of irritability, to find this vital property most remarkably modified—to observe it exalted in one case, and depressed in another, or even otherwise altered in its condition, by agents which impress the organic nervous system, by changes in the vascular system, especially by alterations of the blood, and by the state of the cerebro-spinal nervous influence.

34. *D.* But it is not in connexion with *irritability* only that the functions of the ganglial and sympathetic nervous system should be viewed. This part of the nervous system, or, more correctly, this distinct and separate system—this organic or primary nervous system—presides also over secretion and excretion, as I have already stated. If we view the digestive canal, which possesses both the vital property of irritability, and the no less vital property of secretion—the former in connexion with its muscular tunics, the latter with its villous coat and glandular apparatus—we shall find that every part of this canal, more especially the stomach, duodenum, &c., is supplied with soft or splanchnic nerves; and that this supply is not limited to those fibrils which surround the arteries of these viscera, or to others which proceed from the semilunar ganglion, and aortic plexus; but that these viscera, as well as other secreting viscera, possess in addition numerous minute ganglia and plexuses under their serous and proper coverings, and near to the situations of the principal blood-vessels, which minute ganglia and plexuses are more especially devoted to the functions discharged by the organ or part in which they are situated.

35. Whether the splanchnic or ganglial nerves originate in these corpuscles distributed through an organ or membrane, and successively form themselves, first into fibrils, next into plexuses and minute ganglia, and afterward into larger branches and more manifest plexuses and ganglia, until they converge into the semilunar and other ganglia; or whether they originate, as believed heretofore, in the ganglia themselves, and depart thence to their destinations in the tissues, may not be readily decided; but it is indisputable that they constitute a distinct system; that they send their fibres with the blood-vessels, and with the spinal nerves, to all parts of the body, especially to secreting organs and parts; that they supply both the brain and the spinal cord; and that they form more numerous plexuses and minute ganglia in the several viscera, than have hitherto been described or even supposed; while, on the other hand, the intimate connexion existing between these nerves and the cerebro-spinal nerves is reciprocated by numerous ramifications proceeding from the spinal nerves—from the intercostal, lumbar, &c.—which run to the ganglia and plexuses of the organic nerves, and either proceed through these, or terminate in them, or accompany fibrils from them to various parts, retaining more or less evidently their white and tubular appearance. In viscera possessing more or less of voluntary power in addition to the organic, as the urinary and sexual organs, the vicinities of the sphincters, and the outlets of canals, &c., the supply of the white and tubular nerves—motor and sensory spinal nerves—to the ganglia and plexuses more especially devoted to the functions of these organs and parts, is more abundant and more manifest than in others, these organs combining and requiring the influence of both these nervous systems in the discharge of their functions.

36. II. MEDIA OF MORBID SYMPATHIES.—Having thus directed attention to those preliminary topics which should be duly recognised before we proceed to inquire into the several media by which one organ or part sympathizes with another, or by which the morbid condition of one organ affects another, I now proceed to a general

view of the MEDIA AND MODES OF MORBID SYMPATHY, for there are not only different *media*, but to a certain extent different *modes*, by which these sympathies take place. Associated morbid states or sympathies have been above *classed* into, 1st, the *direct*; 2d, the *indirect*; and, 3d, the *reflected*.

37. i. The FIRST CLASS has for its media, *first*, the *direct communication of nervous fibres*, more particularly the organic nervous fibres; and here the influence of the nervous ganglia in the viscera becomes a matter of very interesting consideration: every important organ is supplied with these ganglia and plexuses, which are, there is every reason to believe, peculiar or modified in size, form, and minute organization, according to the functions each organ has to perform; *second*, continuity of surface or tissue: thus the state of the mucous membrane of the stomach affects the mucous surface of the mouth, the fauces, the pharynx, &c.; and, *third*, the *contiguity of one organ or tissue to another*: during a state of distention the colon presses on the diaphragm, so as to affect the action of the heart and other parts; and flatulence of the stomach disorders the functions of the heart and diaphragm, &c. These constitute the chief direct media of sympathy between different organs—namely, nervous communication, continuity of surface, and contiguity of situation.

38. ii. The SECOND CLASS, or *indirect modes and media* of morbid sympathy, are, *first*, by *vascular communication*. It must be obvious that when a portion of a vessel is affected, another portion of it will experience more or less of disorder. We know, in cases of inflammation or irritation of a lymphatic vessel, how readily the morbid condition extends along it and affects the glands. Here vascular communication, even in these vessels, is a ready medium for conveying morbid action; and it is still more remarkably evinced in respect of the arteries and veins.

39. *Second*, by the states of the circulating fluids. This is one of the most important modes in which morbid action is propagated, and it is one which forms, as it were, the basis—the groundwork, of the system of *humoral pathology*, which for many years was believed in so generally throughout the civilized world. When the morbid affections of the nervous system were so much insisted upon by HOFFMANN and CULLEN, the humoral pathology became obscured, but closer observation and less addiction to theory have shown that the circulating fluids are readily and early disordered in the course of disease, and, being thus disordered, they become sources of a more general malady—of disease not limited to particular organs, but extending more or less to the whole economy.

40. iii. The THIRD CLASS under which I have arranged morbid sympathies is the *reflected*. That this is not a very recently recognised class of sympathies is shown by the fact that it was so denominated and discussed by UNZER and PROCHASNA, and more fully by me as early as 1824. The reflected sympathies are propagated or developed, *first*, by fibrils proceeding to, and communicating with, ganglia or plexuses, and supplying by means of these sources contractile and secreting viscera. Thus irritation occasions the contraction of a portion of intestine; the irritation being propagated most probably to a nervous ganglion, and then reflected in the form of contraction. But it is not improbable, and my recollection of the phenomena I have observed upon irritating visceral parts of the lower animals seems to warrant the inference, that irritation is followed by contraction in a more direct manner, or, at least, in the manner less obviously indirect, than that now mentioned; and contraction may follow irritation without the irritating impression being conveyed to ganglia remote from the organ or part irritated. Thus, when the hearts of some fishes are removed from all their connexions, they will contract, upon irritation, for a short time, the minute ganglia and plexuses in the structure of the organ thus enabling them to react; and so on as regards other hollow organs admitting of a sensible reaction upon irritation.

41. *Second*. The reflected sympathies are developed by means of the communications of the organic or ganglial, or soft nerves, with the roots of the spinal nerves. I was first led to describe the mode in which sympathetic irritation is thus propagated to the muscles of voluntary motion by a singular case which came under my care in 1821, at the Surrey Dispensary. A female, of middle age, presented herself with violent contraction and relaxations of the abdominal muscles, alternating rapidly, regularly, and constantly. The spine evinced no tenderness when examined, no pain nor any other morbid phenomena; and the functions of the extremities and of the urinary organs were unaffected. Conceiving that the affection might be sympathetic of worms in the intestines, I prescribed full doses of turpentine and castor oil, which brought away enormous quantities of lumbricus teres and fæces; and as soon as these were evacuated the morbid action ceased. The irritation of the extremities of the nerves of the digestive canal evidently was in this case conveyed to the roots of the spinal nerves, and was thence reflected by the nerves of motion upon the abdominal muscles. It does not appear necessary to infer that, in this case, the irritation was conveyed to the spinal cord itself, inasmuch as neither morbid sensibility nor other disorder could be traced to it. We can explain the phenomena by considering that morbid irritation was transmitted merely to the roots of the spinal nerves by the ganglial and sympathetic nerves, and that the irritation thus transmitted to these roots produced this affection of the abdominal muscles. The second class, then, of reflected sympathies are those reflected by the ganglionated roots of the spinal nerves.

42. *Third*. Irritations, or impressions are reflected from internal viscera and internal parts, by means, or through the media, of the spinal cord and nerves to the voluntary muscles and extremities of spinal nerves, motion, or sensibility, or both being thereby affected, as shown in several diseases, more especially in hysteria, chorea, neuralgia, tetanus, &c.

43. The *fourth, or last order of reflected sympathies*, are those which take place through the medium of the *medulla oblongata or brain*, or of both. It has long been proved that impressions made on the organs of sense will occasion reflex actions. Indeed, all the phenomena of mind may be said, so far as they produce any sensible motion or action in the economy, to be reflected. This class of sympathies are attended generally in the waking state by consciousness, although not necessarily and uniformly; but during sleep, sensibility, or

consciousness is only occasionally and obscurely excited.

44. III. Circumstances influencing Sympathetic Phenomena. — Having sketched the several modes in which morbid actions or states become associated, and, at the same time, considering that these associations are often brought about through more than one channel, I proceed next briefly to advert to the well-ascertained fact, that irritations, or morbid conditions of any other kind, may exist in organs or parts without producing those sympathetic or symptomatic phenomena which we observe in other persons in a more or less marked degree; and that *sympathetic phenomena vary not only in degree, but also in some measure in character and variety, or number, with the temperament, with the habit of body, with the sex, with the age, with the physical powers, and with the occupations of the individual.*

45. i. It is difficult to determine in what degree or mode the various sympathetic phenomena manifested by the human subject may vary in the *different races of the species.* Judging from my own observation, I am inclined to infer that they are most diversified, numerous, and manifest among the most highly cultivated and luxurious of the Caucasian race, and that they are the least diversified and the least manifest in the negro and the hyperborean races.

46. ii. *Temperament, idiosyncrasy, or diathesis,* has evidently a great influence upon the sympathies — the nervous and irritable temperaments evincing the most varied and most numerous and prominent sympathies; the phlegmatic limiting their range and diminishing their intensity. In nervous, impressible, and excitable persons, irritation or excitement on the one hand, or depression or exhaustion on the other, in whatever part of the economy it may exist, but more especially in sensitive and vital parts, is soon followed by various sympathetic changes, which either would not appear, or not appear to the same extent, in phlegmatic, robust, and muscular persons.

47. iii. Much, however, depends upon the *habit of body* and the vascular conditions of the individual. It may be difficult to determine correctly whether or no fat or very lean persons evince the more prominent range of morbid sympathies. Most probably thin or lean persons are not only more susceptible of sympathetic phenomena, but also evince them more prominently than those who are the subjects of greater or less obesity. A similar difficulty exists respecting the greater influence exerted by vascular plethora, or by deficiency of blood. Probably both extremes, or even an approach to either extreme, may favour the development of morbid sympathies much more than a healthy state of the vascular system —than when a due relation subsists between the contained fluid and the containing vessels—between the healthy quality of the circulating fluids and the tone and energy of the moving powers.

48. iv. *Sex* has a most manifest influence upon the number, character, and prominence of the sympathies. In females, especially those of a nervous and impressible temperament, both the range and the intensity of these phenomena are most striking, and the phenomena developed are most frequently connected with irritation of a particular organ or part, and are attended by more or less morbid sensibility, the nervous systems being generally the media by which their sympathetic affections are developed. In proportion as nervous power is impaired, exhausted, or originally defective in this sex, the more remarkably are susceptibility and excitability manifested, and their more remote consequences evolved. The same remark applies also to males, but the sympathetic phenomena are not so manifest in them, unless in cases of great exhaustion of nervous power.

49. v. *Age* has also a very manifest influence upon the sympathies; the earlier the age, the more readily and rapidly are they developed by the primary morbid affection, and the less frequently are they connected with organic lesions. As life advances, sympathetic phenomena are less frequently and less rapidly evolved; and structural changes either proceed farther without producing them, or produce them less frequently, with less severity, and in less variety. This is especially the case after fifty years of age, and after the latter climacteric age of females. At the period of female puberty, and about the period of the latter sexual change in this sex, sympathetic affections are frequent, prominent, and varied; and in many they continue, at intervals, to partake more or less of this character throughout the whole epoch of uterine activity. After the periods of dentition are passed, when the sympathies are most remarkable, owing to the relations subsisting between the state of the gums and both the ganglial and the cerebro-spinal nervous systems, the most important epoch of both healthy and morbid sympathy—or rather of synergy or physiological sympathy—is the epoch of puberty; after which sympathetic affections diminish in frequency and intensity in this sex, unless in crowded towns, in persons following sedentary occupations, and in the debilitated.

50. vi. The state of *physical power* has manifestly no mean influence upon the sympathies. Where this power has been originally great—where it is associated with nervous energy, and with perfect states of the digestive and assimilative functions—there sympathetic affections are least frequently and least severely complained of, and the least complicated. When organic nervous power is depressed or exhausted, more especially when the exhaustion has proceeded slowly and continued long, a very different result is observed; the irritation of a particular organ or part then develops various affections, sometimes of the same, at other times of a different character, in different or several parts of the frame. Numerous instances illustrative of this pathological position present themselves in practice among both sexes, especially about puberty, and for many years afterward, more particularly in the female sex.

51. vii. The *occupations* of life exert great influence upon the liability to severe or complicated sympathies. It is obvious that sedentary persons, or those occupied in ways which preclude the due exercise of the body in the open air, more especially if they pass much of their time in large towns, or in the impure air of factories, or in unhealthy localities, and those who exert the mind upon abstruse or abstract subjects, will sooner or later acquire an increased susceptibility of morbid impressions and irritations, and these irritations will in them develop a wider range, and a more intense grade of sympathetic affections than in others not similarly circumstanced, all other things being equal. It is incompatible with my limits to pursue this subject farther, or to illustrate my positions by referring to acknowledged facts. This,

as well as what I shall have hereafter to advance, must be viewed rather as suggestive, than as sufficiently illustrative of the subject.

52. IV. SPECIAL CONSIDERATION OF SYMPATHETIC OR ASSOCIATED DISORDERS.—I next proceed to consider, in a more special manner, some of the sympathies most frequently observed in practice, and briefly to notice, or merely to enumerate others. In the view I am about to take of *sympathetic* or *associated morbid states*, I shall consider in succession, *first*, the associated morbid states of digestion and assimilation; *second*, the sympathetic phenomena connected with the circulatory and respiratory functions; *third*, sympathies, or associated morbid states of sensation and sensibility; *fourth*, associated functions, or sympathies of animal motion; and, *last*, the sympathies, or morbid states of the organs of reproduction. I should not have directed attention to this subject, if I had considered that former writers had discussed it fully; but I believe that it will be found, upon referring to pathological writings, that not much has hitherto been said satisfactorily upon it. That morbid sympathies are propagated through the channels I have attempted to point out, receives so frequent a confirmation, and is indeed so constantly observed in practice, that we may conclude that a person labouring under any specific disease, as described by nosological writers, is seldom seen without presenting important morbid associations and sympathetic phenomena. We rarely meet, in the course of medical practice, with a disease implicating one particular tissue or organ, without involving more or less during its progress, distant, although related (related in the manner I have attempted to point out), functions or organs—without displaying various sympathetic phenomena, or associated morbid sensations, conditions, or actions, owing to the several relations which I have here attempted to establish. I now proceed to consider the *first Class*.

53. i. ASSOCIATED SYMPATHIES OR AFFECTIONS OF THE DIGESTIVE OR ASSIMILATIVE ORGANS.—These organs are most important as respects vitality; they are observed throughout the animal kingdom, and, as being intimately connected with the origin and perpetuation of life, demand our more immediate consideration. The sympathies, or associated states of digestion and assimilation, are to be referred, *first*, to the circumstance of these organs being supplied with the same system or order of nerves, the glanglial, and even, according to the view I have suggested, of these nerves partly originating in the villous surfaces and parenchyma of these organs, as shown by the microscope; and to the presence of the organic nervous corpuscles, and their incipient arrangement into fibres, in these tissues and organs. The circumstance of the organic or soft nervous fibres originating thus, and the extension of these fibres to plexuses and ganglia, and thence to the nervous system of animal life, serve to show, or at least go far to explain the fact, that disorders affecting these organs, especially the alimentary canal, affect more or less distant parts, remote organs or parts thereby sympathizing with them. *Second*, to the similarity and continuity of structure existing through a large portion of these organs, particularly the digestive canal. *Third*, to the contiguity of their position. *Fourth*, to the association of function and normal action. *Fifth*, to the several vascular connexions existing between them. Thus it is not through one channel only that these associations are kept up, for no less than five may be considered as contributing to the several states of morbid sympathies or associations which the digestive and assimilative organs present in practice.

54. *First*, the associations of the morbid states of the organs of digestion and assimilation with each other are among the most frequent and prominent in the human economy.—*A*. When we view the intimate connexions existing between the digestive canal and its allied viscera, especially the liver and pancreas, by means of the splanchnic glanglia, plexuses, and ramifications, and of the vascular system, the frequency of these morbid associations cannot remain a matter of surprise. When we consider also the relations of the portal circulation, and view it (as it really is) as independent, in a great measure, of the action of the heart, indeed, so much so as that the return of blood from the liver is much more under the control of the heart, than the supply of blood to the organ by the portal vein—or, in other words, that the return of blood from the hepatic vein is owing more to the action of the heart, than the circulation through the portal system is owing to this organ—we must necessarily infer the operation of some other agency than the heart in carrying on this circulation. Now the capsule of GLISSON, and the ganglial nerves, with which both it and the portal vein are provided, are, in my opinion, the chief agents of this important and independent circulation—agents which operate through the medium of their distributions throughout the organ along with this vein, and which influence not only the circulation of it, but also the circulation of the bile along the ducts. That this capsule at least contributes to, if it does not entirely discharge, this function, may be inferred from its organization; for it is abundantly supplied with ganglial corpuscles and fibrils, and it may therefore be considered as exercising important vital functions. When, therefore, we reflect upon the nervous and vascular connexions of the digestive organs, we must admit that affections of one of the series will be readily propagated to others, and that disorder of the functions of one will necessarily affect more or less the rest. We frequently observe in practice that disorders of the stomach or bowels impede or otherwise affect the functions of the liver; and that torpor, obstructions, congestions, or other disorders of this organ, are followed by affections of the stomach, by congestions of the digestive mucous surface, and indeed of all the vessels which combine to form the portal system; and we have, as more remote consequences, when the original mischief remains, increased exhalations, hæmorrhages, hæmorrhoidal affections, jaundice, and even serous effusion into the peritoneal cavity.

55. Morbid states of the intestinal canal also remarkably affect the functions of the liver, through the medium of the splanchnic nerves, and by influencing the states of the portal system. Irritation of the mucous surface of the intestines, especially of the duodenum and jejunum, is readily propagated to the portal system, and this effect is the most rapidly developed in warm climates, where active determination of blood to the liver, and congestive and other forms of inflammation of it, are thus observed frequently to supervene. The intimate connexion subsisting between these viscera pathologically is evinced also in fevers;

and in these, both in the mode just adverted to, and in another of a different kind. In the course of fevers, hæmorrhages from the digestive mucous surface are not infrequent occurrences, and are most unfavourable as respects the vascular system generally, the portal circulation especially, and the vital powers. In yellow or hæmagastric fever, a fatal termination is generally by a black vomit, which consists chiefly of the blood that has exuded from the mucous surface of the stomach, and often to such an extent as to leave the liver of a pale yellow colour, or altogether bloodless, upon dissection. In these cases, the blood, instead of being carried into the portal vein, is exuded from the digestive mucous surface, leaving the liver in a state of anæmia, especially as regards this vein. (See § 128, 129.)

56. *B. Contiguity or proximity of position* has a great effect in complicating diseases of the digestive organs. This is evidenced by inflammations and inflammatory fevers, more especially when the serous surface of either of these organs is affected. Owing to contiguity, the inflammation is rapidly propagated from one surface to another, not so much by continuity of surface as by contiguity of position. When making post-mortem examinations, I have often found that the opposite surfaces of different organs had become inflamed; that lymph had been thrown out from both at the place of contact, and yet the intervening portion of surface, where contact did not exist, presented no change—that is to say, the inflammation was not propagated by continuity, but by the contact of opposite surfaces: the lymph thrown out from the primarily-inflamed surface had acted as an irritant to the vessels of the opposite part, with which it came in contact, and given rise to inflammation; false membranes, or exudations of lymph, adhesions, &c., being the consequences.

57. Owing to the continuity of surface and similarity of structure, disease extends—more especially erythematic, or asthenic, or cachectic inflammations—along the mucous and serous surfaces, varying in severity in different viscera or situations. Thus inflammations extend not only downward, but also upward—from the stomach to the intestines—from the cæcum to the colon and rectum—from the stomach to the œsophagus, pharynx, and fauces—and from these latter to the trachea, bronchi, &c. Irritations or inflammations of the mucous surface of the duodenum may extend to the mucous surface covering the ducts, especially in weak or cachectic constitutions, in which this extension is most likely to occur; the extension of inflammatory action being most likely to take place in debilitated and cachectic persons, producing inflammation of the ducts, and even of the viscera, from which these ducts proceed; and the limitation of this action being equally favoured by vital or constitutional power.

58. *C.* The state of the muscular tunics of the digestive canal frequently gives rise to important sympathetic phenomena. When the colon is much distended with flatus, or irritated by sordes or morbid secretions, or accumulated fæcal matters, various changes occur, not only in the portion of the canal above the seat of these affections, but also in other parts in the vicinity. I have pointed out already that, in such cases, owing to the nervous communication subsisting between the intestinal canal, the splanchnic ganglia, and the spinal nerves, numerous sympathetic disorders frequently also arise, especially pain in the joints, and various spasmodic affections. I refer merely to the very common phenomena of spasms of the limbs and lower extremities, occurring in bilious colic or in common cholera, and in poisoning by corrosive or irritating substances.

59. *D.* When the circulation is interrupted through the liver, the digestive canal becomes materially affected; and when the latter is deranged, then the former is disordered, and the portal circulation is also more or less deranged. Not only are the functions of the liver and digestive canal thus mutually disturbed in a very remarkable manner, but these disturbances also affect the urinary excretion and the kidneys. When the chyle is not sufficiently assimilated, or when the ingesta are of a character likely to produce inordinate excitement, or other derangement of the vascular system, there are not only associated affections of the liver, through the portal system, but also, in consequence of the morbid changes taking place in the blood, farther changes, more or less extensive, occur in the urinary excretion and organs, particularly in the kidneys. When individuals are otherwise in health, and the kidneys are enabled by nervous power to execute their functions, morbid matters, carried into the blood, are readily eliminated from it by these organs, producing various changes in the urinary excretion; but when the vital powers are weak, either from lesion of the spinal cord or nerves, or of the ganglia supplying those organs, or from general nervous depression or exhaustion, then there will be observed more or less serious disorder of the urine, or even the kidneys themselves.

60. Even in comparative health we find a very intimate connexion existing between the states of other excreting organs and the kidneys. For instance, when the functions of the kidneys are but temporarily obstructed, the blood to a certain degree becomes impure, and very important and deleterious elements, which should have been eliminated from the blood by these channels, are then either vicariously removed by other emunctories, the circulation being the while often more or less disordered, or the blood becomes contaminated and the vessels congested. Again, when the function of the cutaneous surface is materially deranged—when it is suppressed—if the individual is otherwise healthy—if there is no disorder connected with the urinary organs—these organs perform an increased function, and matters which should have been carried out of the system by the skin are removed by the kidneys, and often no severe disorder arises; but not unfrequently serious derangements take place, owing to suppression of the cutaneous function. Thus disease of the skin, or suppressed perspiration, or disorder of the urinary functions, often produces a number of morbid actions—at first vicariously—occasioning increased action of the one emunctory as the action of the other is impaired or obstructed, and subsequently very serious changes, both of the blood and of vital organs and parts, if the impaired or suppressed function be not restored.

61. The most serious and rapid derangements are produced in the circulating fluids, and consecutively in other parts of the economy, by impeded or obstructed function of the kidneys. In all

lesions of these organs, especially in that which is called "Bright's disease," very important changes take place in the circulation; and, owing to these, farther changes are produced in distant and different parts of the economy: the heart and the liver, the mucous and serous membranes, owing to the state of the blood, and more particularly to the circulation of effete or injurious elements in it, become irritated; and organic changes, especially asthenic or spreading inflammation, the exudation of lymph, and more frequently of a serous or albuminous fluid, take place on the surfaces of these organs and of these membranes.

62. In connexion with disorder of the digestive organs, we very frequently find the appearance of the skin more or less changed, even independently of the actual existence of jaundice. It would appear that, when the liver is torpid or inactive, or when affections of the liver are connected with disorder of the stomach, or of the spleen, or of the bowels, the blood becomes more or less impure, or even deficient in red globules; and, consequently, the external surface and the countenance are more or less sallow, lurid, or without the vital glow of health. The liver performs not only secreting but excreting functions; it eliminates certain elements from the circulation, which, if allowed to remain, would produce more or less disorder: it thus depurates the blood to some extent; and hence we find that, in torpid affections of the liver, these elements accumulate in the blood, and, independently of true jaundice, produce slight pseudo-jaundice, or a lurid state of the skin and countenance, which is attributable to the impaired excretion of materials which usually contribute to the formation of bile. But in cases of jaundice, where the obstruction is more serious, owing to the excretion of bile from the liver being impeded or prevented, or to the presence of calculi in the ducts or in the gall-bladder, or to numerous organic changes that take place in the organ, there are certain constituents of the bile absorbed into the circulation, and certain of these more abundantly in some cases than in others. In some instances the colouring matter only is present, while in others, the resinous portion of the bile, or the *bilin* of modern chemists, is carried into the circulation. It is very rarely that bile can be detected in the blood, but it has been detected in the urine; and we may therefore infer that it must have passed through the circulation before it arrived there, and that the kidneys, by the active discharge of their functions, have carried it out before it could accumulate in the blood so as to enable the chemist to detect it by the taste of the blood, or by the usual tests. I have already adverted to the effect of congestion, or interrupted circulation in the liver, on the abdominal organs generally, especially upon the digestive canal. I believe that this morbid association is not sufficiently attended to, particularly in respect of the diseases most prevalent in malarious and warm climates, and in fevers and disorders of the bowels in temperate countries; but my limits prevent me from pursuing this topic any farther at this place.

63. ii. The Sympathy between the Digestive Organs and the Functions of the Heart and Lungs, owing to the media of association above described, is so marked, that disorder of any one of these organs naturally produces a reciprocative disorder in the other organs. Thus, increased excitement of the nervous system occasions excitement of the vascular system; and exhaustion or debility of the organic nervous system produces a similar state of all the organs which this system actuates. It may be considered an axiom, that increased excitement, or its opposite, namely, exhaustion or debility, however produced, is attended by a co-ordinate grade of such state in the several vital organs. So obviously is this the case, that it is unnecessary to enlarge upon it.

64. *A. By contiguity of position*, the digestive, circulating, and respiratory organs are often very materially affected. Distention of the stomach or alimentary canal mechanically impedes the function of the other organs, and heightens inflammatory or structural lesions. Hence arises a deranged state of the circulation and of respiration in individuals in whom the nervous energy is weak, and where the contractile power of the parietes of the heart is to a certain extent weakened also. The contractile actions of the heart are much influenced by the distention of contiguous viscera. Flatus distending the stomach, and rising to the œsophagus, often produces intermittent or irregular pulse and various consecutive phenomena. This is frequently seen in cases of flatulency of the digestive organs. Very serious affections supervene in the case of hysterical and nervous patients, where the flatus rises up in the form of globus hystericus, producing inordinate distention of the œsophagus, with spasm above or below, or both above and below, the seat of this distention. The phenomena remarked in hysteria, in colic, and in flatulent distentions of the colon, may farther illustrate the influence of mechanical distentions of parts of the digestive canal upon the functions of the heart and lungs; and hence it is, when the nervous and muscular powers of the heart are impaired, or when the vital expansive power of the lungs is weakened, that flatulent distentions of the stomach or of the colon increase the mischief. The number of morbid sympathies that I shall have to mention in the confined space to which I am limited prevents me from illustrating fully this subject.

65. *B.* In considering the relation of the circulating and respiratory functions, it is unnecessary to do more than to notice the very great influence which the latter exerts upon the former; the remarkable changes produced by the atmosphere during respiration, and the advantages that accrue from respiring pure air, not only in promoting a normal state of the blood, but in strengthening the locomotive functions. Air and exercise are the best restoratives that we possess—the principal tonics that we can employ in removing disorder. Those medicinal tonics which are frequently substituted for these, owing either to the circumstances of the case or to the views of the physician, are generally more or less stimulants also, and may be injurious, and indeed are often hurtful, when injudiciously employed. But when the patient can have change of air—when he is able to undergo a change, and can be duly exposed to the air and to the sun's influence, and more especially when he can take sufficient exercise in the air—due assimilation of the food, healthy changes in the blood by the respiratory organs and cutaneous surface, and the development of nervous and vital energies, are the usual results.

66. *C.* I need only briefly refer to the intimate sympathy between the *digestive and the respira-*

tory functions, surfaces, and organs. It rarely occurs that the respiratory mucous surface is much affected without the digestive mucous surface being also more or less disordered, or that the latter is seriously deranged without some disorder or susceptibility of disorder being manifested by the former, the association being clearly referable to the nervous system in the more immediate effects, and to the vascular system in the progress of the disorder. But affections of the mucous or villous surfaces of these distinct organs, although often thus appearing in succession —the one arising or depending upon the other —often also occur contemporaneously and coordinately. This form of association frequently is the result of endemic causes and of epidemic influences; the morbid impression of these causes often extending rapidly, and manifesting its effect upon the digestive organs soon after it has acted upon the respiratory functions. Catarrhs, influenzas, hooping-cough, and other epidemic disorders which proceed from or are influenced by the states or vicissitudes of the atmosphere, and prevail at certain seasons, especially manifest this association; and those more formidable epidemics which arise from an atmospheric contamination, caused by the emanations proceeding from the sick, or from numbers of living creatures confined in a limited space, or from dead vegetable and animal matter, evince the same association, although in a much more remarkable manner, and are greatly heightened by contamination of the fluids and soft solids of the body.

67. When the atmosphere contains only a small or moderate amount of malaria, or of animal emanations, or a quantity insufficient to contaminate it to a pestilential extent, or even to cause agues or remittents, then disorders of the digestive organs, associated with affections of the respiratory and circulating functions, frequently result. In large towns and cities, especially where a humid and close air is more or less contaminated with animal exhalations, the prevailing disorders of the digestive organs are very often associated with affections of the respiratory organs, more particularly with chronic or asthenic bronchitis, or with congested states of the lungs. This association is most frequent among the children of the poor; either affection predominating over or masking the other, owing to the intensity or combination of the causes.

68. Whether those causes affect children, adults, or the aged—more especially if the more ordinary physical conditions and vicissitudes of the atmosphere have added to them, animal emanations, putrid effluvia, and insufficient ventilation —the effects produced seldom consist of a simple or specific state of disease, but of an association of maladies; one or two assuming a more distinct or prominent form, according to the intensity of the efficient agent, to the nature of concurring influences, and to the state or predisposition of the patient's constitution. This complication becomes still greater, and much more serious, if these causes not only injuriously impress the organic or ganglial nervous system, but also, either through the medium of this system, or still more directly, contaminate the circulating fluids — the contamination arising both from the impairment of depurating processes performed by the various emunctories, and from the passage of injurious agents into the blood during respiration.

69. Physicians who observe closely the morbid conditions constantly coming before them must have remarked, especially in large towns, where numerous injurious agents are in almost continued operation, and among persons who attend the least to the healthy states of the digestive and excreting functions, that when the digestive functions are much impaired, or when the digestive mucous surface presents those phenomena which may rationally be referred to chronic irritation, numerous associated disorders soon present themselves. The hepatic functions are deranged; often also the bowels are affected; and ultimately even the excretions from the skin and kidneys betray more or less disorder. The results of these morbid conditions, or more frequently the contemporaneous mischiefs, comprise changes in the nervous and vascular systems — functional changes in the organic nervous system, being followed by impairment of the excreting or depurating actions, and this impairment by an altered state of the blood itself; this last acting upon the former, and aggravating them. As long as vital power or resistance to the injurious agents is not entirely overthrown, various vicissitudes occur in the course of functional disorder, in the states which the several organs implicated present, and in the consequences which accrue in respect of each, under the influence of either aided or unaided vitality. But not unfrequently various serious phenomena, threatening the duration of life, appear, owing to contingent causes and morbid predispositions. It is thus we so frequently observe in practice, among persons who have been previously out of health, who have been intemperate and dissipated, who have suffered from functional disorders of the stomach, or liver, or bowels, or kidneys, or from an association of two or more of these, that far more serious maladies are superinduced; that, owing to the morbid state of the blood from impaired action of the emunctories, and to the disposition of irritation or inflammation of membranous parts to spread in these circumstances, erysipelas thus often appears in the seat of an abrasion or injury, especially in certain atmospheric conditions; that the pharynx or fauces, or both, sometimes with their connected glands, become affected with a spreading or asthenic inflammation, that the lesion, owing to continuity of texture and weakened vital resistance, proceeds either along the œsophagus to the stomach, or, what is still worse, it extends from the pharynx to the epiglottis, or even down the trachea, causing distressing paroxysms of cough, or threatening, and even causing suffocation from closure of the glottis, or fatal congestion of the lungs. The lesion, thus first manifesting itself in the fauces or pharynx, may actually even commence in the stomach, and extend upward along the œsophagus to the pharynx, without the œsophageal affection being either recognised or prominently developed, until the more sensitive and susceptible pharynx is reached. Indeed, it is not unfrequently observed that acrid eructations from a dyspeptic stomach, or owing to a state of gastro-enteric irritation, excite an asthenic form of inflammation of the pharynx and posterior fauces, which sometimes spreads in one or other of the directions just pointed out, either involving merely, or chiefly, the upper portion of the œsophagus, or implicating more especially the epiglottis and larynx, or even also the trachea. These are some of the more serious or extreme morbid associations ob-

served between the digestive and respiratory organs; but others of a slighter grade are much more common; these are stomach cough, the *catarrhus stomachicus*, *catarrhus saburralis*, &c., of older writers; the association of gastro-intestinal irritation with catarrh, or with bronchitis, or other affections of collatitious or even of distant viscera, &c.

70. iii. THE SYMPATHIES OF THE DIGESTIVE ORGANS WITH THE BRAIN AND WITH THE ORGANS OF SENSE, AND OF THE LATTER WITH THE FORMER, are sufficiently manifest. But it is very frequently by no means easy, when the associated morbid conditions come before us in practice, to determine the organ primarily affected, and most probably the source or centre of the associated affections.—*A.* The *media* of morbid association in many of these complications are obviously and primarily the ganglial and the cerebro-spinal nervous systems, as already explained. But cases are not few, which acknowledge, not only these media, but also the vascular system—a morbid condition of the circulating fluids. When the blood is loaded with effete matters, or is not sufficiently acted upon in the liver, or changed by the several depurating organs, or by the lungs, or by the kidneys and skin, it affects the brain, producing, more or less, disorder according to the nature of the existing impurity. This state of the blood, in its slighter grades, may give rise only to lassitude, or to a state of apathy, or more or less lethargy. It is not improbable that the lethargy observed after a full meal is partly caused by the passage of chyle into the blood, which, to a certain extent, changes the state of this fluid, and affects the brain. When the blood is more seriously altered, when it is affected by obstruction of the excretion of bile, and when it is still more remarkably changed, both in quantity and quality, by disease of the kidneys, the effect upon the brain is often serious, and in the latter case even fatal. In more common cases and circumstances, and in those of much more frequent occurrence, impaired digestion is followed by imperfect assimilation of the chyle; this latter, more or less, affects the blood, and the state of the blood thus produced often affects the sensibility of the brain and nervous system, either temporarily or at intervals, even before the actions of the emunctories are manifestly impeded or otherwise disordered.

71. *B. The organs of sense* often sympathize with disorders of the digestive organs. Those of sight, hearing, smell, and taste are severally weakened or rendered more susceptible of impressions, in some instances, or less so in others, when the functions of digestion are imperfectly performed, owing to impairment of the ganglial nervous power, actuating the digestive organs, having extended to the nerves and organs of sense, with which the ganglial nerves are intimately connected, especially as respects the cerebral and cervical ganglia and plexuses. Nor should it be overlooked that, when the influence or power of the ganglial nerves, which supply the vessels and membranes secreting the fluids which enable the nerves of sense to perform their functions, is insufficiently exerted or is depressed, these fluids are then insufficiently secreted, the membranes imperfectly nourished; and consequently, the sensorial surfaces, and the terminations of the nerves of sense in these surfaces, are not in a fit state to receive impressions, and are incapable of transmitting them so vividly and perfectly as if the organic or ganglial nervous system duly discharged its duty.

72. iv. THE LOCOMOTIVE APPARATUS SYMPATHIZES MORE OR LESS WITH THE STATE OF THE DIGESTIVE AND ASSIMILATING ORGANS.—The former, however, may not be much affected when the latter are slightly disordered; but if the disorder of the digestive functions continue long, or if it be great—if the organic nervous or vital energy of these organs be much reduced or exhausted by previous excitement, and, still more remarkably, if this depression of vital energy have, owing to its continuance or severity, given rise to a morbid condition of the circulating fluids, or to an excrementitial plethora, the locomotive power always suffers more or less. The joints are particularly disposed to manifest disorder when the digestive and assimilating functions are imperfectly performed, and the secreting apparatus of the joints then suffers more especially. When urea, or its elements, accumulate in the blood, or, indeed, when either these or other excrementitial elements accumulate in the circulation, or when mal-assimilated or other injurious matters are conveyed into the circulating fluids, and more particularly when the functions of the liver, of the bowels, and of the kidneys betray disorder, the joints then often become seriously affected. If the history of various diseases affecting the joints be carefully traced, and their several morbid relations observed, it will very often be found that impaired digestion and assimilating function, as well as impeded excretion, has long preceded, and often still more remarkably attends the affection of the joint. *Gout* furnishes the most remarkable instance of this morbid association; but rheumatism also displays it. Other disorders hereafter to be mentioned, as hysteria, also betray the connexion between them and affections of both the joints and the digestive organs. The sympathy in these morbid associations is obviously dependent upon the ganglial nervous system and its connexion with the sensory spinal nerves, and is increased and rendered more permanent, especially in gout, by changes in the circulating fluids, and by imperfect elimination of effete materials, or of the ultimate products of assimilation and animalization, by the several emunctories.

73. v. THE SYMPATHIES OF THE REPRODUCTIVE ORGANS WITH THE FUNCTIONS OF DIGESTION are often obvious. They will be more particularly noticed in the sequel; but I may now observe that debility of the latter often deranges the former, or predisposes to most of the disorders to which the reproductive organs, especially of the female, are liable. There is, however, a mutual action and reaction between disordered conditions of these organs and the organs of digestion; and even in these cases, which occur so frequently in practice, where the association of these disorders is very remarkable, it is often very difficult to determine which of these organs is primarily in fault. Many cases of chlorosis, of amenorrhœa or dysmenorrhœa, or even of menstrual obstruction, of hysteria, and of leucorrhœa, are more or less dependent upon disordered digestion and assimilation, while others originate, as will be mentioned hereafter, very differently, and consecutively derange the digestive functions.

74. V. THE SYMPATHETIC AND SYMPTOMATIC PHENOMENA CONNECTED WITH THE CIRCULATING

AND RESPIRATORY FUNCTIONS.—I shall here offer some observations on the importance of considering morbid action with reference to the state of the circulating fluids.—i. Having discussed, as fully as my limits permit, the nervous connexions giving rise to numerous and obvious sympathies, I shall now take a general view of *alterations of the blood itself*, as being productive of diseased action, either in succession or contemporaneously, in two or more distinct or distant organs, or more or less throughout the frame. In disorders of the circulating fluids, particularly of the blood, the most extensive and serious associations of disease often arise to which the animal economy is liable.

75. The circulating and respiratory functions are intimately associated with each other, not only by nervous and vascular connexions, but also by position and by the nature of the functions themselves; a certain amount of change of the constituent elements of the blood always taking place during respiration, and also a reaction of the blood on the respiratory organs, and on the heart and blood-vessels. These vital functions, although presenting more or less prominent relations to disorders of other or distant organs, are often, owing to these circumstances, jointly and correlatively the affected.

76. *A.* Before I take a cursory view of the results of chemical researches into the morbid changes of the blood, I shall briefly notice the *healthy composition of this fluid*. From a series of analyses, SIMON considered that 1000 parts of healthy blood consist of 795 3-10ths of water, and about 204 3-10ths of solid residue. In the latter there are 2 1-10th of fibrin, 2 3-10ths of fat, 76 6-10ths of albumen, 109 3-10ths of hæmato-globulin, and about 12 parts salts and extractive matter These being the mean proportions in health, it has been attempted to establish the deviations which take place in these constituents in disease. A number of chemists and physiologists have performed experiments on the blood both in health and in disease, but there is a considerable difference between the results at which they have arrived; still there is sufficient agreement to warrant the importance of attention being devoted to the subject.

77. In *disease*, the water varies from 888 parts in 1000 to 750 parts; the solid residue from 250 to 112. Of the different matters forming the solid residue, fibrin varies from 9 1-10th to a trace merely; the fat, from 4 3-10ths to only 7-10ths; the albumen, from 131 to 55 1-10th; the hæmato-globulin, from 115 4-10ths to 31 2-10ths; the extractive matter and salts, from 16 5-10ths to 7 6-10ths; these results thus showing a very considerable variation in the quantities of the several constituents of the blood in disease.

78. *Healthy blood*, again, according to LECANU, consists of 790 parts in each 1000 of water, and 210 parts of solid residue. Of the latter, 3 parts consist of fibrin, 127 of blood-corpuscles, 72 of albumen, and 8 of extractive matter and salts, or what he calls inorganic matter. According to ANDRAL and GAVARRET, taking this to be the standard of health, these constituents vary in *disease* as follows: The water from 915 parts in each 1000 to 725; the solid residue from 275 to 85. Of the latter, the fibrin varies from 10 5-10ths to 9-10ths only, the blood-corpuscles from 185 to 21; the albumen from 114 to 57.

79. It must be evident that the blood which is taken from young, healthy, or robust persons, especially those of the sanguine temperament and the phlogistic diathesis, will exhibit a large proportion of blood-globules or corpuscles, and also of fibrin; while the blood of leucophlegmatic or of chlorotic and anæmied persons will furnish the smallest proportion of these constituents and the largest quantity of water. When the blood is removed, or being removed from a vein, and especially as it circulates in the vessels, there certainly exists in it more or less carbonic acid, although the exact quantity—probably of various amount with the varying state of the system—can hardly be shown by experiment. It is, doubtless, given off so immediately, on being removed from a vein, that its exact quantity scarcely admits of demonstration. The blood also presents a certain *odour*, either independently of, or connected with the halitus, or vapour, or carbonic acid, which it exhales, when drawn from a vein or artery; and this odour is very remarkable in malignant and infectious diseases, and especially in pestilential fevers.

80. It is very manifest that the blood, when circulating in the system, possesses a vital endowment, derived from the organic nervous influence, bestowed by means of the organic nerves on the blood-vessels, and on the tissues and parenchyma of organs through which the blood circulates. This vitality of the circulating fluids, thus derived, may be traced in the chyle, and is manifested by this fluid as soon as it begins to circulate in the lacteals, inasmuch as it presents analogous changes to those evinced by the blood itself, as respects coagulation, when removed from these vessels.

81. The globules of the chyle present the first appearances of organization; or, in other words, assimilation and organization, commencing in the chyle and manifesting themselves in the conformation of the globules formed in this fluid, proceed as the chyle passes through the glands, becoming more distinct and perfect as the chyle advances and reaches the ducts conveying it into the blood. The globules of the chyle, being thus more perfect and more numerous the nearer they approach the venous circulation, and after having passed through lacteal glands and having derived some vitality from the vessels and glands through which they have circulated, possess in consequence a vital relation with these parts, tending, not merely to promote their circulation onward to the blood-vessels, but preparing them also for farther changes—for a more advanced grade of organization, when they have reached this goal, and for the assumption of the character of perfect blood-globules.* It is not at all improbable that the assimilation or the organization of the

* Since this article was written, the researches of Mr. WHARTON JONES on the blood have been published in the Philosophical Transactions From these it would appear that the chyle-corpuscles pass through the following phases of development before, or by the time of, their reaching the venous circulation: *First phase*, that of granular cell, the first stage of this phase being coarsely granular, the second stage finely granular: *second phase*, that of nucleated cell, the first stage of this phase being uncoloured, and the second being coloured. He considers that the *nucleated cell*, in its second or coloured stage, passes into the *red corpuscle*, in the fully-formed blood of man and the mammalia, and that the nucleated cell is thus changed into the fully-formed red blood-corpuscle, by the cellæform nucleus of the nucleated cell being set free by the bursting of the cell itself, the nucleus having become filled and red by the secretion of globuline and colouring matter into its interior.

globules of the chyle, as well as of those lymph-globules circulating in the lymphatics, either originates in, or is advanced by, the glands in the course of both lacteals and lymphatics; and it may also be inferred that the farther organization of the lymph-globules—both those carried into the blood from the lacteals and those from the lymphatics—or their conversion into the fully-formed red blood-corpuscles, is owing to the vital operation of those glands which are not provided with excreting ducts; as the spleen, the supra-renal glands, and the thymus, and probably also of the liver. The facts long and frequently remarked by me of anæmia, or deficiency of red-globules, being always the consequence of torpor, enlargement, or other disease of the spleen or liver, favour this view of the influence of these viscera in the assimilation or development of the chyle and lymph-globules into red blood-globules. It may therefore be inferred, from the organization of the lacteal and lymphatic vessels and glands, and of those non-excreting glands just mentioned—from the circumstance of these organs being abundantly provided with ganglial nerves, blood-vessels, and absorbents, that the fluids carried to, and circulating through them, undergo an assimilation, and that this assimilation amounts to a progressively increasing organization of the globular constituents of these fluids—this being the function of the organs now referred to.

82. Organization thus commencing in the chyle or lymph, as respects the perpetuation of the individual animal, it must necessarily follow that these fluids participate in the vitality existing in the vessels and organs through which they circulate. This vital endowment, whether existing in the fluids as a simple emanation from the containing structures, or actuating them more efficiently through the medium of their globules, is evidently concerned in the phenomena displayed by these fluids, as well as by the blood when removed from the vessels, as I contended many years ago; the changes observed to take place in these fluids, and more especially their coagulation, being the consequences chiefly of the loss of the vitality, or of the organic nervous influence or emanation endowing these fluids. If, therefore, it be admitted—and it cannot be rationally disputed, or with a due recognition of healthy and of morbid phenomena—that the circulating fluids are thus vitally endowed, it must necessarily follow that this endowment is dependent upon, and co-ordinate with, the vitality or the organic nervous energy of the frame; and, farther, that whatever contaminates these fluids must necessarily co-ordinately affect the vitality of the frame through which the contaminated fluids circulate.

83. *B.* Contamination of the circulating fluids may commence, 1st, in the lacteals, through the medium of the digestive canal; 2d, in the lungs, through the medium of the respiratory surfaces; 3d, in any part of the external surface of the body; and, 4th, in any part or tissue of the frame, by a self-contamination; and, thus originating, the contamination may manifest itself either generally, coetaneously, and co-ordinately throughout the frame; or prominently, and especially upon particular organs or parts, other organs or parts betraying comparatively but little disturbance. Of these sources of contamination I shall take a very brief and passing view, as far as they may elucidate the associations of disease.

84. 1st. If the lacteals communicate with veins concurring to form the portal circulation, as some assert, and believe that they have demonstrated, and whether this communication take place before or after they have passed through their glands, or does not take place at all, the injurious influence of a contaminated or unwholesome chyle upon the circulation, and the organs through which it passes, will readily be admitted. If the contaminated chyle passes more directly into the blood circulating to the portal vessels, and without pursuing the longer route to the general venous circulation, it must necessarily follow that the functions, and even the organization of the liver and its vessels, will be placed in great jeopardy; and it may be farther inferred that, whatever may be the route which the chyle takes, the globules will not undergo their wonted healthy advances towards complete organization either before they reach the blood, or after they have entered into it. It is even very probable that the blood, thus abounding in an unwholesome or contaminated chyle, and with imperfectly assimilated or organized chyle or lymph-globules, will disorder the functions, and ultimately the organization of those structures and organs more immediately concerned in perfecting these globules, or transmuting them into perfect red blood-globules.

85. 2d. The second channel of contamination, or that through the respiratory organs, hardly requires any notice, it being so obviously one through which the most injurious agents are conveyed into the blood itself, thereby infecting or contaminating this fluid, and, through its medium, either remote parts, with which the particular agent may have especial relations, or the whole frame. It is through the respiratory surfaces that the emanations from numerous sources infect the system—effluvia from the soil and its productions, and exhalations from dead animal matters and from diseased bodies; and although this source of contamination and infection is the most obvious to every one who is capable of speculating respecting the causation of disease, especially when considered in connexion with the functions of the respiratory organs, yet it has been most frequently overlooked or insufficiently estimated. The blood is affected not only by the physical constitution of the air as respects temperature, humidity, electrical conditions, but also by those foreign gases, vapours, and emanations from living and dead organized bodies existing on the earth's surface. These severally, sometimes variously associated, affect both the vital conditions of the lungs—the organic nervous energy of the organ—and thus directly, as well as indirectly, modify the changes which take place in the blood circulating through the lungs, or otherwise contaminate this fluid in modes more or less specially related to the nature of the causes or agents which operate through this channel. (See *art.* Infection.)

86. 3d. The *third* or cutaneous channel of contamination is certainly less frequently influential than those already passed in review. Still, all the physical conditions of the atmosphere, and all the foreign gases, vapours, and emanations floating in the air, which so readily and injuriously invade the system through the respiratory organs, also affect the functions of the skin, and

thereby the conditions of the blood, and the states of the several internal viscera, and more particularly of the other excreting organs. The most serious contaminations of the circulating fluids, and of adjoining parts produced through the medium of the cutaneous surface, arise from the septic influence of a foul or infected air upon this surface when it is punctured, abraded, or deprived of that protection at any one point which the cuticle or epithelium is destined to afford, or when mucous surfaces, and especially serous surfaces, are exposed to this cause. In these circumstances, the skin itself, in some instances; the lymphatics or veins, or both, in other cases; or the cellular tissue, in some; and even all these, in a few, are seriously affected, and ultimately the blood itself is more or less contaminated; remote parts, and even the whole frame, becoming thereby implicated in the foul, septic, and disorganizing process thus commenced and most rapidly propagated. And here I may advert to the influence of the air in many situations, but more especially in towns and ill-ventilated places and houses, in extending disease originating in, or chiefly consisting of, lesion of the cutaneous surface; and the insufficient attention usually paid in practice to a due protection of exposed points of the cutaneous surface from the influence of the air, and to the exclusion of this fluid from deep-seated injuries or diseases. Nature provides a spontaneous remedy against the endosmosis or imbibition of infectious or contaminating agents existing in the air, by throwing out lymph, which, by coagulating, protects the exposed or injured point or surface; but the powers of life, as manifested by the capillary system, are not always adequate to this effect, and the consequences are the imbibition of septic matters, which contaminate the surrounding tissues and the fluids taken up by the absorbing vessels, and occasion a spreading, or asthenic, or diffusive inflammation of these vessels, of the lymphatic glands, and of the adjoining cellular tissue, the most manifest changes in the blood itself, and not infrequently extensive disorganization of remote organs and parts.

87. The changes thus arising in, and propagated from, the third channel of contamination, sometimes equally originate in and are propagated from deep-seated or internal parts, through the medium of circulating fluids and vessels, to distant situations, where they may be manifested only or chiefly. In the articles ABSCESS, ABSORPTION, BLOOD, DISEASE, and INFECTION, I have fully shown the manner in which morbid secretions or other depositions may contaminate not only the adjoining tissues, but also the circulating fluids, and ultimately occasion disorganization, and the formation of puriform or other morbid collections or lesions in distant organs or parts. I have so fully enlarged, in the places just indicated, on the views and doctrines which these consecutive lesions involve, that I need not allude to them at this place, more especially as they have been adopted by subsequent and recent writers; not always, however, with a due acknowledgment of the original sources.

88. It having thus been shown that the formation and perfection of the chyle and lymph-globules are probably owing to the vital influence of the vessels and glands through which they circulate, and that the metamorphosis of these globules to perfect red blood-globules is due to the functions of the glands not possessing excreting ducts, and of the liver, it necessarily follows that the absorption or passage of injurious, imperfectly assimilated, or other morbid matters into this fluid must occasion disease in the organs more especially devoted to these functions; while impaired function of these organs, or structural lesions of them, must also impede or interrupt the progressive changes of these globules, and the formation of perfect blood-globules; the conditions of the blood itself becoming thus more or less imperfect or diseased, and incapable of undergoing in the lungs those changes which are requisite to the due nutrition of the frame, and healthy condition of the several viscera.

89. What the exact conformation of the several globules existing in the chyle, lymph, and blood may be, is not, perhaps, yet fully determined, or, at least, admitted, by the numerous observers who have attempted to investigate the subject. But it may, at least, be inferred that these globules undergo a progressive organization, and that the organs already mentioned are instrumental in producing it; but it should likewise be considered that the changes produced in the blood in the lungs and in the general circulation, as well as the influence of the air upon the blood, are also more or less intimately connected with the perfection of these globules, as well as with whatever alterations they may undergo subsequently to their full development. Neither microscopic nor speculative physiologists have shown the nature of the relation existing between the atmospheric elements and the blood-globules and other constituents of the blood, so as to explain the phenomena of nutrition and the sustentation of nervous or vital energy. Certain of the more manifest phenomena have been remarked, but not accurately traced or irrefragably demonstrated. It may be asserted that the oxygen of the air combines with the blood-globules, and gives rise to changes necessary to nutrition, to nervous endowment, and even to the circulation of the blood itself. But it is quite as difficult to prove as to disprove this proposition, with the subordinate relations between these globules and the several general systems and special organs which this proposition involves.

90. At the present day, the chemical changes which occur in the blood have become subjects of discussion, and too generally with an entire neglect of those alterations which arise from the states of vital power. The former can seldom be recognised in practice, and are often unappreciable even in the most dangerous diseases; while the latter are generally the most manifest and characteristic, and present themselves in this manner to the unaided senses. To these latter, therefore, our attention should be directed, inasmuch as they indicate not merely the states of the blood itself, as respects its more important constituents, but also the conditions of organic nervous or vital power—conditions of the utmost importance to be correctly estimated by the physician. It should not, moreover, be overlooked that even the most gross and evident chemical changes are merely the results of vital power and vascular action controlling the changes which are imputed to chemical affinities; but which are truly the results of a vital chemistry, or of affinities controlled by vital forces. Whatever may be the nature of the intimate chemical changes which take place in the blood, either in the lungs,

or in any other organ, there is every reason to assert that these changes would not result if the organic nervous influence were removed from the organ in which they take place in health; and farther, a close observation of the causation of the changes observed in the blood during disease leaves me to infer that most of those changes are more or less influenced or produced by conditions of nervous energy or vital power, chemical action or affinity having nothing to do with the matter, farther than in favouring the combinations of alkaline bases with oxygen, and of these or other compounds with acids; and those combinations even are favoured or controlled by the vital powers.

91. In speculating upon the changes taking place in the blood, the chief places are assigned, as agents, to the oxygen of the air, and to the carbonic acid or its constituents, as existing in the blood. What change, if any, may be effected by the nitrogen of the atmosphere, is not ascertained. It is supposed that azote produces little or no alteration of the blood; yet it is not unlikely that, although the amount may not be appreciated or appreciable—at least there is no admission of appreciation by chemists—there is, nevertheless, a change produced by it, both on the fluids which are carried into, and on the fluids which circulate in the system.

92. *C.* In the various speculations on the changes occurring in the blood in health and disease, until the appearance of the article BLOOD in this work (in 1832), and to which article some more recent writers have been much more indebted than they are willing to admit, the alterations of the blood —*the pathology of the blood*—have been very imperfectly and worse than superficially treated of. And while physiologists and pathologists have directed some attention to the processes of sanguification, they have altogether neglected to show how *the destruction or waste of the hæmato-globuline or red corpuscles takes place*, so as to prevent, during assimilation and nutrition, an exuberance —a morbid plethora—of this constituent of the circulating fluid from occurring.—*a.* A topic which has not been considered with reference to the healthy state can hardly be supposed to have been investigated in connexion with disease. But it cannot be unreasonable to infer, that in health the waste may proceed from the following sources: 1st, from a partial vital decomposition and conversion of the hæmato-globuline or red-corpuscles to supply by nutrition the waste of the several tissues; 2d, from the conversion of a portion of the globules in the portal vessels into bile; 3d, from the action of the mucous follicles, especially of those seated in the lower portion of the small, and in the whole of the large bowels, upon the blood conveyed to them; 4th, from the operation of the other emunctories, although in a much less degree, especially the kidneys and skin, the epithelium-cells, thrown off by these, being transformed blood-globules, either before or after they had acquired their colouring matter or property; and, 5th, from the elaboration of the sexual fluids and discharges in both sexes.

93. *b. During disease*, the waste of the hæmato-globuline or red corpuscles may be either hastened, increased, or impeded, more rarely the latter. It may be hastened or *increased*, 1st, by insufficient assimilation, owing to impaired organic nervous or vital power; 2d, by morbidly increased action of the liver; 3d, by increased action or elimination of the emunctories, especially of the intestinal follicles and surface of the skin and of the kidneys, owing to the impaired vital endowment of the globules and crasis of the blood having provided these emunctories with an increased pabulum, or material whereby their actions are augmented; and, 4th, by the morbid or increased action of the sexual organs in either sex. Owing to the excessive action of these sources of waste, the blood may become poor or deficient in hæmato-globuline and red corpuscles; and accordingly we find, not only where assimilation is deficient, owing either to inanition or impaired vital power, but also where either of these sources becomes inordinate for any continuance, that a poor state of the blood or anæmia takes place. In low or adynamic fevers, in diarrhœa or dysentery, in some affections of the kidneys, in leucorrhœa, in self-pollution, and in excessive sexual intercourses, in acute rheumatism, especially when attended by excessive perspiration, this state of the blood generally supervenes. As respects rheumatism, this result escaped the observation of previous writers, until I mentioned it when treating of this disease. (See *art.* RHEUMATISM, § 84, *et seq.*)

94. *D.* During the process of circulation, in consequence of the changes that take place in the chyle and blood-globules, of the absorption of chyle from the digestive canal, and of effete matters from the several tissues, considerable changes must necessarily take place in the blood, and, as the result of these, numerous phenomena must be produced in, and evinced by, the excreting organs—the skin, the lungs, the liver, the intestinal canal, and the kidneys. There appears to be a very intimate sympathy between the functions of these organs. Many years ago, I had an opportunity of putting that subject to the test. In 1814 and 1815, I was engaged in a number of experiments on the effects of temperature upon respiration and the blood in different states of the system, and the results of those experiments were afterward published. Subsequently, when visiting an unhealthy and warm climate, I had an opportunity of observing the changes there produced in the air by the respiration of individuals of different races, and found that, during cold states of the atmosphere, and soon after digestion, the greatest changes took place in the blood—the greatest consumption of oxygen, and the greatest amount of carbonic acid then appearing in the expired air; while in a very warm state of the atmosphere, and several hours after a meal, when the vital powers are depressed, the smallest amount of oxygen was consumed, and of carbonic acid existed in the expired air; and these latter effects were most manifest when the system was subjected to the influence of malaria. It was also farther considered that the cutaneous function was, to a certain extent, supplemental to the function of respiration; that, in fact, as observed in some of the lower animals, the cutaneous function is, to a considerable degree, one of respiration. This, even in the human species, appears to be the case, more especially as regards negroes. I made several experiments, in a very warm climate, on the respiratory functions of this race, and found that the quantity of carbonic acid given off from the lungs in this variety of the species was almost one third less than that given off by the lungs of an European of the same size, and at the same temperature; while in the former,

the changes taking place on the cutaneous surface were greater in degree, and more extensive in kind, than in the latter—the supplemental respiratory function of the skin of the negro being not only more remarkable as regarded the formation of carbonic acid and the exhalation of watery vapour, but also peculiar as respected the amount of animal matter and effluvium impregnating the exhaled vapour and watery fluid.

95. I attempted at that time to account for the prevalence of fevers, and disorders of the biliary functions, &c., so prevalent among Europeans migrating to a warm climate, by the state of the blood consequent upon the diminished changes produced by the air on the blood, and by the superabundance of the elements from which bile is formed existing in the circulation; the liver thus for a time performing a vicarious action to the lungs—the deficient function of the lungs, in an European in warm climates, being made up by the greater activity of the liver. However, this exists in individuals only for some time after they arrive in a warm climate, and very frequently it is not so remarkable after a year's residence there. Active exercise, also, in a warm climate, by increasing the functions of respiration and cutaneous exhalation, remarkably relieves the increased function of the liver, and prevents many of the consequences of this disorder.

96. There is also a very intimate connexion existing between the state of the blood and the depurating offices of the mucous surface of the intestines, especially of the large intestines. This surface, and more particularly the follicular glands, may be considered as eliminating from the blood redundant or decomposed blood-globules (§ 92), and much effete materials, and as thereby contributing, with the other emunctories, to the purity and healthy condition of this fluid. The connexion subsisting between the functions of excreting viscera, not only as altering the condition of the blood, but also as affecting each other individually—the influence which the state of one depurating function exerts upon the others, through the medium of the blood, as well as through that of the organic nervous system, and the mutual and conjoint operation of all these functions, not merely in changing the physical appearances and constitution of the blood, and the states of vital influence, but also in occasioning structural alterations, are among the most important topics comprised by a rational system of pathology. Without due consideration being devoted to them, the morbid changes constituting the progressive periods of disease, the media of connexion subsisting between affections of distant parts, and the passage of one alteration into another, cannot be traced; and the association of disease of one organ, with equal or even greater disease of another organ, cannot be explained, and neither anticipated nor guarded against in practice.

97. *E.* It is of great importance to the physician to observe closely the *physical appearances or sensible characters of the blood*, when removed from the subject of disease, both immediately upon and some time after its removal. It is hardly possible for him to devote his attention to the analysis or *chemical constitution* of this fluid, inasmuch as this requires considerable time and diversified experiments to arrive at satisfactory conclusions; and, besides, many of the changes observed are truly vital, or at least the results of departing vitality, and are either very imperfectly, or not at all, indicated by chemical analysis or tests, although frequently manifested by distinct physical characters. The physical appearances of the blood, when removed from the body during the life of the patient, are of the utmost importance, as indicating not only the conditions of this fluid *per se*, but also the states of vital power; and as furnishing the chief indications of cure. My limits will not admit of my noticing, otherwise than in very general terms, the principal alterations of the blood, which tend both to associate alterations of distant parts, and even to contaminate more or less the soft solids of the body. The perusal of what has been done by chemists, even down to the present day, to demonstrate the chemical changes of the blood, even in the advanced stages of disease, will furnish but little information which can be used practically, compared with attentive observation of the physical changes of this fluid. These latter changes I have fully described in another place (see *art.* Blood), and therefore I shall not even briefly advert to them now, but merely notice two or three topics connected with the subject more immediately under consideration, some of which have not received sufficient attention from other writers.

98. *a.* Various changes as respects the *colour* of the blood, both at the time of removing it from the vein and afterward, have been observed. The blood may present every shade of colour, from a pinkish hue, or a pale or florid red, to a deep red, or a brownish or dark red, or dark violet, or even to a brownish or black, or dark greenish hue. The first of these colours is observed chiefly in cases of anæmia; the latter of them in congestive diseases; and the last chiefly in pestilential or malignant maladies, or in cases of poisoning—indicating not only a contaminated state of the blood, but also impaired organic nervous influence of the vessels and vital organs.

99. *b.* But it is not merely the colour of the blood, but also the rapidity and mode of its *coagulation*, and the *state of the coagulum*, that requires the attention of the physician. The relative proportions of coagulum and serum; the firmness, or the flaccidity or softness of the former; the presence of cupping of the coagulum, or of the buffy coat, and the thickness and density of the buff, are circumstances which will be duly estimated by him, as indications of organic nervous energy or excitement—of states of increased vascular action and of vital resistance. He will, from these conditions of the blood, infer existing states of the whole vascular system, and of the organic nervous system as actuating the vascular—viewing these conditions as the results of the states of these; and while he estimates them all at their true value, he will not attribute undue importance to any one condition apart from the rest. He will not, as in a case to which I was recently called, after taking away between thirty and forty ounces of blood, again take away nearly as much within a few hours, merely because the latter cupfuls of the former bleeding were cupped and buffed, and thus nearly destroy the patient; but experience will soon show him, if education have not taught him, that, in inflammatory affections of serous or fibrous tissues, and in diseases attended by vascular excitement, without loss of vital power or resistance, or infectious contamination of the blood, the fibrin continuing abundant, the coagulum may present these appearances

to the last, and even although it may be relatively small to the amount of serum.

100. But in different states of the organic nervous influence or vital power, and owing to these states either primarily or consecutively, the blood presents very opposite physical characters. It coagulates more rapidly and more imperfectly, or even hardly coagulates at all, or at least does not separate into any coagulum distinct from the serum. These characters are usually observed in depressed states of vital power and resistance, and in contaminated or poisoned conditions of the blood, and are owing either to absorption of contaminating and morbid matters, or to interrupted depuration by the several emunctories. In some malignant diseases characterized by extreme depression of vital energy, with a rapid state of the circulation, the change in the appearances of the blood has been most remarkable and sudden or speedy in its accession. In the worst form of puerperal fever—a disease which I have seen go on to a fatal issue within twenty-four hours from its accession, and for which blood-letting was often most improperly and fatally employed, because it had been recommended by some dangerous because ignorant writers — the blood has, in some instances to which I was called, subsequently to its abstraction, presented the appearance of a straw-coloured and very thin jelly, without any coagulum, the colouring matter being precipitated to the bottom of the vessel of a black hue, and in the manner of a powder which had been mechanically mixed in the fluid which had suspended it, and without the least cohesion between its particles. In these cases, as well as in some other maladies characterized by extreme depression of vital power, and a poisoned state of the blood, the coagulation is not only imperfect, but is of a peculiar kind; the colouring matter being detached from the other constituents of the blood almost as soon as the blood passes from the vein, the fibrinous elements forming a thin jelly with the serum of the blood. The small amount of vitality possessed by the blood in these cases is lost immediately upon its abstraction from the body; and the fibrin, although it may exist in tolerable quantity, is incapable of contracting or adhering so as to form a coagulum, yet often uniting so loosely in the serum as to form a thin gelatinous mass.

101. *F.* The *quantity* of blood in the system has also a very important influence in associating diseases of distant organs or parts; and this influence becomes still greater and more general if the blood either abound in excrementitial elements, or be in any way poisoned or contaminated. The quantity of blood may be diminished as respects either the general amount, or the colouring constituents, or hæmato-globulin; and it may be deficient in a single organ. It is not unusual to observe in cases of general anæmia an irregular distribution of the blood, some organ or part experiencing an excess, while the diminution is still more remarkable in other parts. This is usually observed when, with anæmia, there exists local irritation, or excitement of the organic nervous influence of a particular organ. In this way distant parts often present consentaneous morbid phenomena, and the organ which has received to-day a more than proportionate supply of that blood which is deficient either in general amount, or in colouring matter, or in fibrin, or in all these together, may present on the morrow more than usual deficiency; and thus a new combination of disorders may arise. This is not unfrequently met with in nervous, susceptible, and hysterical persons, in whom the distribution of blood is always more or less under the control of the nervous system, more especially the ganglial.

102. If the influence of these states of the circulation be remarkable in associating disorders of distant parts, that produced by the opposite state, or too great fulness, is not the less so, more especially if the fulness be attended by an excess of effete or excrementitial elements. Vascular plethora, as long as the blood is duly changed by the emunctories, favours active determination to particular organs, especially to those liable to irritation or nervous excitement—not unfrequently also to acute inflammations and active hæmorrhages, according to the diathesis and the nature of exciting or concurring causes. But if excrementitial fulness supervene, owing to the imperfect discharge of some depurating function, as that of the kidneys, some distant organ is placed in great jeopardy, or effusion takes place in shut cavities, or in the cellular tissues. But these results may equally occur although the amount of blood in the system previously had been in due relation to the frame, and to the capacity and state of the vascular system. It frequently is observed in practice, that a previously healthy person, in respect of his vascular system especially, is exposed to causes which arrest the cutaneous excretions, and he experiences a slight attack of fever, or local determination to some predisposed organ, or diarrhœa, or some other affection, especially if the kidneys have not performed a vicarious office in supplying the suppressed function of the skin. A healthy person, also, is exposed to causes, as infections, which depress organic nervous energy, and thereby impair or suppress the more important depurating and secreting functions. The consequences as respects the blood are obvious. This fluid soon abounds in effete and injurious elements, increasing both the amount of vascular contents, and oppressing and irritating the whole vascular system, although certain organs may manifest these effects in a more prominent manner than others, until a salutary crisis is observed, and the morbid state of the blood is removed; or until the soft solids are changed, their vital cohesion is loosened, and disorganization ensues.

103. *G.* I need not pursue this subject farther, seeing that I have fully discussed it in several parts of this work; but I wish to direct attention to one topic more particularly connected with it, and which, in its relations to various maladies, has been most unaccountably overlooked — namely, to the probable want of correspondence, on some occasions, between the capacity of the vascular system and the amount of its contents, between the area of the containing vessels and the amount of fluids contained.—*a.* This presumed want of adaptation, or of accordance, may be great, quite irrespective of the quality or condition of the circulating fluid; the tone of the containing vessels being so remarkably deficient, owing to depression of the organic nervous power, as not to occasion the due accommodation between the vessels and the blood circulating in them—as not to admit of that amount of vital contraction and adaptation of the vessels necessary to the due performance of the circulation, and to the retention in them of the more fluid parts of the blood,

which, either alone or with more or less of the hæmato-globulin, readily escape from the relaxed capillaries in the more yielding surfaces and erectile tissues. Now a due correspondence between the containing vessels and the contained fluids, and the mutual influences, both vital and mechanical, resulting from this correspondence, and from the healthy conditions of both the vessels and the fluids, are obviously wanting, in a more or less remarkable manner, in many maladies, especially in several malignant and pestilential fevers, more especially where the vital powers are remarkably depressed; and it is chiefly owing to this depression that the vascular system is incapable of accommodating itself to the amount of its contents. In these circumstances, the pulse is at first broad, open, soft, and compressible, although it is subsequently small, feeble, creeping, or undulating; and the abstracting of even a small quantity of blood, or the loss of it by the passive hæmorrhages or exudations, which often occur very rapidly, sinks the patient, by increasing the want of correspondence, now pointed out, between the capacity of the vessels and the amount of blood they contain.

104. *b.* This want of correspondence, or of vital accordance between the blood-vessels and their contents, may arise also from a different pathological condition, namely, from the blood being so deficient in quantity, as not to impart the requisite state of *tension* to the coats of the vessels; and hence, when the vital tone of the vessels is impaired at the same time that the blood is deficient in quantity, the current of the circulation is irregular and languid; and vascular action, which was already asthenic when the vital tone of the vessels was impaired, becomes much more asthenic when the blood is also deficient in quantity, fatal congestion and sinking of the vital powers ultimately supervening.

105. In pestilential maladies, and even in other malignant diseases, the tendency to death is to be imputed as much to this increasing want of accordance—to the progressive defect of vital and mechanical adaptation, between the vessels and the blood, as to the changes which have actually taken place in the constitution of the blood; and several of the associated phenomena, characterizing the advanced and last stages of these maladies, are to be ascribed to this circumstance—to this pathological condition existing so generally throughout the vascular system. Thus, in the hæmagastric pestilence, or true yellow fever, the phenomena observed in its progress, and the acceleration of death by passive hæmorrhages, or the black vomit in its last stage, are readily explained according to this view; while the more successful mode of treatment for this malady is that which is directed to these changes in the vascular system, and to the state of organic nervous influence upon which these changes originally depend.

106. That this want of accordance between the amount of blood in the vessels and the capacity of the blood-vessels, this deficient vital adaptation of the vessels to the amount of their contents, is a most important pathological condition existing in the progress of several malignant diseases, and associating the affections of distant organs; and, moreover, that death in these diseases is to be imputed rather to this circumstance, to this condition, than to the poisoned or altered constitution of the blood, heightened as it often is, at an advanced stage, by passive hæmorrhages, are facts illustrated by the course of several maladies, and demonstrated by what is observed after death from hæmorrhages and from hæmagastric pestilence. In the last stage of this latter malady, and as the altered blood—altered as regards its vital condition, physical appearances, chemical condition, and in the loss of the greater part of its fibrin—exudes from the mucous surfaces and outlets, the circulation becomes remarkably slow, the vessels appear and feel soft, relaxed, flaccid, and imperfectly filled; the blood returns to the right side of the heart in deficient quantity and celerity; absorption of fluid from the digestive organs is arrested; and ultimately the heart's action ceases, from an insufficient return or supply of blood to the right auricle. Upon examination after death, the digestive canal contains much black grumous matter, consisting chiefly of altered blood, or of matters similar to those thrown off from the stomach and bowels for some time before death; the abdominal vessels, and especially those contributing to the portal system, the ramifications of the vena porta, and the hepatic veins, are empty, and the liver is remarkably pale. The whole vascular system is deficient of blood. Analogous changes characterize the last stage of other maladies, as pestilential cholera, plague, &c., the chief difference being that, in the former especially, the watery parts of the blood are those principally lost, the parts which are left being not only insufficient for the maintenance of a due correspondence between it and the vessels, but also unsuited to capillary circulation, and to the sustentation of the vital functions; the soft solids being also more or less deficient in vital cohesion, and rapidly passing into dissolution, as I have shown on several occasions, and especially when treating of these maladies.

107. *H.* It being admitted, and the fact cannot be disputed, that changes in the quantity and quality or state of the blood, and, still more remarkably, changes in both quantity and quality, associate disease of several organs, both those intimately connected anatomically and those more distantly related physiologically, it must necessarily follow that not merely functional disturbance of these several remote as well as proximate organs is thereby produced and associated, but also structural changes and the most extensive disorganizations of these organs often result. But it is not sufficient for us to take for granted these changes in the blood and vascular system, in thus complicating or associating disorders and distempers, and in developing various sympathetic ailments: it is of importance to us to trace these changes to their sources, and to view their relations, in order that we may the more fully comprehend their extent, and hence be enabled the more satisfactorily to prevent their accession, to arrest their progress, or to counteract their effects. I have already pointed out, briefly and inadequately, several of these sources and their pathological relations, and referred to the parts of this work where these topics are more fully discussed, and therefore I shall now merely enumerate the several conditions to which attention should be directed in our investigations of the sympathies, or the morbid associations and complications resulting from alterations of the blood and vascular system.

108. *First.* The state of organic nervous influence in relation to the agents affecting it, and

to the resulting influences and changes upon the vascular system and blood.

109. *Second.* Imperfect chymification and chylification, owing to the unwholesome nature of the ingesta, or to impaired digestive function, or to morbid states of the digestive mucous surface; the chyle being either imperfectly elaborated, or of so unhealthy a constitution as to affect the glands and viscera through which it circulates while passing onward to the blood, and after it has mixed with this fluid.

110. *Third.* The absorption of morbid secretions, excretions, or other matters, either from the digestive canal and mucous surfaces, or from cellular parts, or parenchymatous organs or other structures, these matters often inflaming the blood-vessels or the absorbents and glands, contaminating the blood, producing chronic or hectic fever, irritating or inflaming remote vessels and organs, or giving rise to abscesses or purulent deposits, diffused or encysted, primary or secondary, in distant parts, as more fully shown in the articles "*Abscess*," "*Absorption*," "*Blood*," and "*Disease*," in this work, and in my paper on the "*Pathology of the Veins*," in the Medical Gazette.

111. *Fourth.* Suppression, interruption, or diminution of any of the eliminating or depurating functions—of either of the excretory actions, by which effete materials are removed from the blood, and this fluid is preserved in a healthy condition; interruption of one or more of these functions, altering the state of the blood, changing the healthy relations subsisting between it and the heart and vascular system generally, disordering the other excreting organs, exciting general vascular disturbance, and superinducing various changes, contaminations, effusions, and even disorganizations in several organs or parts, or generally throughout the frame.

112. *Fifth.* The exciting or depressing emotions of mind—all influences, excitants, or agents, affecting either the cerebral, or spinal, or the ganglial sensibility—all inordinate excitations of the mind, passions, or sentiments; or of the senses and muscular movements; or of any of the organs requisite to the continuance of the life of the individual, or the perpetuation of the species, are liable to be followed by sympathetic disorder of distant but related parts, owing to the organic nervous connexions already pointed out, to the changes frequently produced in the fluids—the chylous, lymphatic, and sanguineous—to the consecutive changes of nervous power, and electro-motive conditions of the general systems of the body, and to the *unity*, as well as to the special systems and conditions of the frame.

113. From one or other, or from two or more, of these, numerous associated morbid conditions result, some of which conditions have been variously estimated and classed, with the narrow but vain view of giving them the individuality and identity displayed by the genera and species of the animal and vegetable kingdoms, characteristics which they are altogether incapable of evincing, owing to the diversified features, associations, and complications resulting from these five great sources, and their innumerable states, modifications, and progressive changes. The most common, at the same time the most uniform of the special results, proceeding from these sources, the most frequent of these sympathetic associations and morbid complications, in which changes throughout the whole frame are most remarkably produced, and most intimately dependent upon each other, through the *media* especially of the organic nervous system, and of the vascular system and blood, are the following:

114. 1st. Sympathetic or symptomatic states of vascular excitement or action, resulting from changes in the organic or cerebro-spinal sensibility of parts; or from local injury, or from inflammation, pressure, or other local changes—*symptomatic fevers*. The media of general disorder in these are, first, the nervous systems, and consecutively the vascular system and blood, the several concomitant and intercurrent changes, varying in different cases with the nature of the causes, and the numerous circumstances connected with these causes, and with the individual affected.

115. 2d. Chronic or hectic febrile conditions, resulting generally from a persistent source of irritation implicating primarily the organic nervous function, and consecutively changing the nutrition and secretions of the part, and ultimately altering the states of vascular action and of the blood; followed frequently by absorption of morbid, or puriform, or tubercular matters into the circulation, by consecutive deposits, abscesses, &c. *Hectic and chronic fevers*, consequent upon local irritations, tubercular deposits, encysted abscesses, carious bones, and malignant formations, &c., are all of this description, and are ultimately accompanied by altered conditions of the blood, imperfect assimilation, anæmia, &c.

116. 3d. Periodic fevers, or febrile and painful states of the system, arising from malaria, and varying in character with the concentration of the effluvium, and with the proportion or amount of emanation from dead animal matter which is conjoined with it. The morbid impression in these diseases is made primarily upon the organic nervous system, the vascular system and blood being consecutively affected, and various visceral affections often ultimately resulting.

117. 4th. Adynamic, typhoid, and putrid fevers, or those arising from the emanations proceeding from living or dead animal matter. The morbid impression is made by those emanations primarily and principally upon the organic nervous system, although the blood may also be primarily contaminated, as it obviously is consecutively, the soft solids generally becoming, through these media, ultimately more or less implicated.

118. 5th Exanthematous and pestilential fevers, or those fevers arising from specific morbid poisons. The morbid impression is generally made in these distempers in ways similar to those now stated (§ 117), and the results are equally general and serious, often most rapidly fatal, particular fevers presenting peculiar characters.

119. In all these maladies, although the organic nervous system, in the usual mode of exposure to these exciting causes, receives the first morbid impression, especially when the poison is inhaled with the air into the lungs, the blood soon becomes contaminated, owing either to the absorption of a portion of that poison, or to the influence of the primarily induced morbid condition of the organic nervous system, in impairing the several secreting and excreting functions, and in altering in this way not merely the healthy constitution of the blood, but also the vital adaptation of the vascular system generally and of the amount of blood to each other; and, moreover, in destroying, both by the primary impression on

the organic nervous system, and by the consecutive effects, the vital cohesion of the several simple tissues, structures, and compound organs.

120. These several classes of disease, whether viewed individually or in the aggregate, remarkably illustrate the great extent to which not merely functional disorder, but structural disease, and even more or less general disorganization, may be associated, when a poisonous influence impresses any one portion of the congeries of ganglia and plexuses constituting the organic nervous system, or contaminates the circulating fluids; the effects being the more rapid, the more general, and the more fatal, the more concentrated or intense the poison, and the more unequivocally and immediately the primary changes are produced, both in this system and in the blood and vascular system.

121. The influences affecting the circulating fluids, may therefore, be classed under four heads: *first*, that of the nervous systems, more especially the organic nervous influence; *second*, the state of the chyle resulting from the nature of the ingesta; *third*, the absorption of morbid or poisonous matters into the circulation, from any surface, organ, or part; *fourth*, interrupted excretion.

122. Important and extensive changes are produced on the blood by the several eliminating organs, by the liver, the digestive mucous canal, the respiratory surface, especially the lungs, the skin, and the kidneys. An interruption to either or several of the functions of these organs more or less alters the circulating fluids; but when the constitutional powers are not materially affected or depressed, a slight interruption to the discharge of one excreting function is very frequently followed by vicariously increased action of another excreting function, and thus the system is preserved without experiencing much detriment, in many cases of such interruption.

123. *I.* The importance of considering the state of the blood, with reference to the causes affecting it, is remarkably great, particularly with reference to fevers. In the different forms of fever, where disorders of function, and ultimately structural changes in the organs themselves, become the most extensive, it is seldom that we find one organ implicated alone, but several in rapid succession, or contemporaneously. Inflammatory lesion of a particular tissue or organ, with which the system sympathizes through the channels pointed out—namely, nervous organic influence, the blood, continuity and contiguity of surface or structure—implicates the whole frame. The functions of the most remote organs become affected thereby, and generally in proportion to the extent to which the circulating fluids are disordered. If vascular action, and especially if the circulating fluids be materially affected, co-ordinate disorder of the urinary and digestive organs, and also of the functions of the brain, generally ensues. Owing to the bonds which unite the frame into a whole, and intimately associate all the viscera, it has been supposed that all fevers are merely the general or sympathetic disturbance of this whole, arising from a more or less prominent affection of one organ. Several writers have attempted thus to localize all forms of fever, and to consider them merely as modifications of inflammatory fever; but I need not allude to these attempts, as they have been disproved when treating of the pathology of fever.

124. It would be interesting, if space allowed, to trace the manner in which the several systems of the frame become affected during the progress of fevers. In respect of periodic fevers, or those which arise from malaria, it may be briefly remarked, that the causes producing them seem to affect primarily and especially the organic nervous system; and that the fluids and abdominal viscera become more or less disordered secondarily. Intermittent and remittent fevers may not appear until weeks after the individual has been exposed to malaria, and then the paroxysms occur at intervals. We know that morbid impressions, or irritations, or other morbid conditions of nervous parts, usually assume a periodic character. If it were the blood which is primarily affected in these cases, it must follow that the state of the blood which existed during the paroxysm would continue during the intermission, until removed; and that, instead of presenting intervals when comparatively little disorder is felt, the disease would be continued; for, in proportion as the blood becomes affected in fever, so does the disease assume a more and more continued type. There are various lesions prominently affecting particular organs, and which give fevers a variety of character: thus we have gastric fever, intestinal fever, bilious fever, and so on. If we proceed to the consideration of the worst forms of fever—for instance, typhus or pestilential fever—not only is the nervous system affected, the organic nervous system being probably the first to be impressed with the cause of the disease; but also the blood itself soon becomes more or less contaminated and altered—becomes physically changed.

125. Now the question is, whether this change, produced so early in the blood in typhoid and pestilential fevers, arises primarily from the absorption of the cause into the blood, or whether it proceeds from the morbid impression made primarily on the organic nervous system, owing to which impression the excreting or depurating functions, which are under the influence of this system, are impaired or arrested, and the circulating vessels and fluids become thereby affected, and ultimately changed? I have shown how copiously the vascular system is supplied by the organic nervous or ganglial system, and hence we may expect, *à priori*, that causes affecting this system will, to a co-ordinate extent, affect the vascular system and the fluids circulating in the vessels. We find that, in the progress of fevers, the blood becomes changed; and the change may arise partly from the impression made by the emanations causing the fever upon the organic nervous system, and partly from the absorption of the emanation—of the morbid poison itself—into the circulating mass. I believe that the infecting or morbid effluvium, being received into the lungs with the air, injuriously affects the organic nervous system supplying these organs; hence the blood in the lungs is not sufficiently changed by respiration. Possibly, also, partial absorption of this effluvium may take place into the blood itself; but if it does not, there is a still stronger reason to infer that the morbid impression extends throughout the organic nervous system, impairing or otherwise altering the influence of this system upon the vascular system, and in the secreting, assimilating, and excreting viscera. The organic nervous power being depressed, it naturally follows that the organs sup-

plied by this system become impaired in function; and hence we find that, in the first days, or within the first twenty-four hours of fever, the functions of the excreting organs are very remarkably diminished, or even suppressed, and the consequence is, that the blood, which may have been hitherto unaffected, is more or less changed; or, if it have been already affected by the cause of the disease, or by the impression on the ganglial system, becomes still farther changed. Thus the one change reacts on the other, and promotes it, until at last the changes in the organic or vital nervous influence in the vascular system, and in the circulating fluids, become so great, that the blood is not only altered sensibly as respects both its physical characters and its chemical qualities, but the tissues and organs themselves become more and more disorganized, or evince a remarkable loss of their natural vital cohesion, especially in putro-adynamic fevers, and distempers of a malignant character. This subject is so fully illustrated in the articles BLOOD, DISEASE, INFECTION, FEVERS, and PESTILENCE, that it is unnecessary to pursue it farther at this place.

126. ii. *The influence of obstructed circulation through, or of other lesions of, the heart itself, independently of any material change in the constitution of the blood in complicating diseases*, and the intimate connexion existing between the circulation through the heart and that through the lungs, has been already adverted to; but so much have we been in the habit, in consequence of the modes of teaching and writing generally adopted, of viewing disease nosologically, and of regarding one species as being altogether distinct from another; and so injuriously has this acted in the practice of medicine, that we have been thereby actually prevented from seeing the connexion subsisting between different diseases, and of observing how intimately they are associated, and how readily the disorder of one organ induces or passes into that of another, until experience and repeated observation have destroyed the impressions of erroneous education and of false precepts. We often observe persons with short or hurried respiration on the least exertion, which has often been considered as a form of asthma, and the disease has been looked for in the respiratory organs. The patient has been said to have spasm of the bronchi or the trachea, or some disorder of the respiratory passages, which has produced this disordered respiration. But now that we have traced out more intimately the relation of the disorder of one organ to another, we have found that in these cases the lungs may be free from disease, farther than congestion arising from interruption to the circulation through the heart; and we have discovered that, in the majority of such cases, the lungs are only secondarily affected, and that the heart is primarily in fault. This condition of the respiration is most frequently owing to this cause, even where there is but slight disease in the heart. Thus, in weakened, nervous, and susceptible persons, the affection of either organ soon extends to the other. If the lungs are disordered, the heart becomes affected; or if the heart is primarily affected, the lungs become disordered—the least excitement of one organ extends to the other. In many persons of lax fibre, or of a lymphatic or leucophlegmatic constitution, the parietes of the heart are deficient in tone, or are partially changed in their intimate structure, and dilatation of the cavities or other alterations often take place, so as to give rise to imperfect or irregular, or interrupted circulation, and consequent congestion, with or without effusion, either in the vicinity of the congested viscera or in more distant parts; *the subordinate circulating apparatuses, or the subordinate orders of the vascular system, namely, the vascular apparatuses of the liver, brain, and lungs, especially suffering derangement.* Numerous instances present themselves in practice of consecutive affections, of a complicated character, appearing as the disease advances, during hooping-cough, dry catarrh, asthma, &c.; the heart, the brain and spinal cord, and their membranes, the portal circulation, &c., becoming secondarily affected, in addition to organic changes, often also produced in the lungs themselves, and in their investing membranes.

127. The connexion subsisting between dilatations, often slight, of one or more of the cavities of the heart, and between lesions of the valves and orifices, and congestions of the subordinate orders of the vascular system just specified, more especially those of the lungs, liver, and brain, is sufficiently obvious, particularly when the heart betrays any of these lesions. But there is every reason to infer that congestions of the lungs may actually take place to even a fatal extent, without any very obvious organic lesion of the heart, or lesion of such an extent as can account for the occurrence. Thus severe shocks to the nervous system, mental or physical, severe injuries of vital parts, and agents acting with great intensity, and either inordinately depressing or exhausting vital power, occasion remarkable congestion of the lungs, sometimes also of the other subordinate orders of the vascular system, more especially in persons already the subjects of a fatty, dilated, or relaxed state of the parietes of the heart's cavities. Congestion of the lungs, however induced, even in slighter grades, is a serious morbid condition, inasmuch as it arises from, or is connected with various other lesions, either of vital action or of structural change, especially of the parts now stated; and as it generally leads on to farther alterations, to inflammatory action, to hæmorrhages, and various organic lesions, especially when neglected or improperly treated.

128. iii. *The sympathies between states of the circulation and those of the digestive organs* are so obvious as hardly to deserve notice. The functions of digestion and assimilation languish when those of circulation and respiration are impaired; and when the respiratory, and especially the circulating actions, are morbidly excited, distaste of food, nausea, thirst, and costiveness are common consequences. In these circumstances, the digestive villous surfaces become injected or congested, and the vascular disorder is often imputed to, instead of being viewed as causing, this change. Wherefore, it may be asked, are these surfaces often so prominently affected in cases of general vascular excitement? Because the vascular excitement does not always extend to the portal circulation, and the return of blood from the related viscera through the portal and hepatic veins is not so rapid and complete as the circulation through the arteries supplying the digestive canal; hence the congestion in many acute and chronic diseases of the digestive villous surface, and the rapid disorganization often consequent upon it, especially when organic nervous power is depressed, as in malignant or pestilential fe-

vers, in gastric remittents, and in typhoid, adynamic, and intestinal fevers.

129. The liver also often experiences consequent congestion or other disorder when the general circulation is either much accelerated, as above, or much impeded, as in cases of cardiac or pulmonary disease. The frequent occurrence of congestion of the liver in the course of these and other maladies, especially of those affecting the organic nervous influence, is a matter deserving notice. This congestion may be, in a great measure, owing to the circumstance of the circulation through the portal vessels being almost entirely removed from the influence of the heart. The circulation through these vessels appears to be owing to the organic nerves which supply them, and when the influence of these nerves is depressed, the circulation in the liver is co-ordinately impaired or impeded. I believe, also, that the capsule of GLISSON is also very influential in promoting this circulation, and this capsule is abundantly supplied with soft ganglial nerves, whereby the vital action of the portal vessels is re-enforced with nervous influence. In all cases where there is cardiac disease, and congestion of the lungs consequent upon it, there is generally congestion of the liver. Both organs are intimately associated by means not only of the vascular system and the circulating fluids, but also of organic nervous influence, both organs being supplied by the same class of nerves. Again, the circulation through the liver, to which I have already partially adverted, is very much influenced by the state of the fluids and matters absorbed into the circulation even from the stomach itself, but principally from the intestinal canal. Stimulating, irritating, or imperfectly assimilated matters, when carried into the portal circulation, must necessarily irritate or excite the liver, and thereby ultimately produce changes of its structure.

130. iv. *The sympathy existing between the cardiac and pulmonary circulation and the brain* need only be mentioned to be admitted. The effect of disordered circulation through the heart upon the brain is a matter of very great importance, and one which, until recently, has not been sufficiently adverted to. The subject, however, has been fully discussed in the articles on APOPLEXY and DISEASES OF THE HEART, where it was shown that a number of cases of congestive apoplexy, of hæmorrhagic apoplexy, and of palsy, are occasioned by interruption to the return of blood from the head, owing to lesions of the parietes of the heart's cavities, or of the valves and orifices of the heart, with or without congestion of the lungs, according to the side of the heart in which the primary lesions are seated. This is a complication of very great importance, inasmuch as the symptoms are usually referred to disease of the brain, and are often considered premonitory of apoplexy or palsy, and are often treated as such without reference to the state of the heart, the pulse being tolerably regular; and yet, on examining the heart by auscultation, serious disease of this organ is found. I have had many patients who have long complained of symptoms referable entirely to the brain, the heart betraying to them not the least disorder, and yet in this latter organ was seated the primary, and often the most extensive disease.

131. Owing to insufficiency of the valve, or to dilatation of the right aurico-ventricular orifice, or to what is a still more rare occurrence, to disease of the valves at the commencement of the pulmonary artery, occasioning obstructed circulation, there is regurgitation of blood from the ventricle into the auricle, and then a series of changes supervene, as respects the circulation not only in the brain, but also in the liver and kidneys. At first, lesion of the functions of these organs, or of one of them in a more prominent manner, is observed, with more or less remarkable congestion; and subsequently structural change, with either serous or sanguineous effusion, anasarca, hæmorrhages, &c. The blood being partly thrown back at each contraction of the ventricle into the auricle, the regurgitation into the vena cava superior and inferior occasions congestion of the brain, liver, and kidneys, and its consequences, as just assigned. When there is dilatation of the right auriculo-ventricular orifice, or insufficiency of the valve, the effect upon the venous circulation is made manifest in the pulsation of the jugular veins, and the consecutive lesions just mentioned soon supervene. I have observed these associated changes in the cases of three eminent medical men who were under my care, and in two of whom I had an opportunity of making a post-mortem examination.

132. When these lesions occur in the left side of the heart, and which situation is much the most frequent, they interrupt the circulation through the lungs: congestion of the lungs takes place, and, in consequence of it, I have seen the changes supervene that I have now mentioned with reference to the right side of the heart. The congestion is usually to a great extent, and there is either effusion into the pleural cavities, or hæmorrhage of the lungs, or pulmonary apoplexy. There are other associated changes which require merely to be mentioned, but I shall allude only to organic diseases of the heart and kidneys. When treating, in the article KIDNEY, on granular degenerations of this organ, I fully showed that they were the results of a cachectic inflammation of the secreting structure of the kidney, especially of the Malpighian tufts, consequent upon a morbid state of the blood, and were sometimes also connected with organic changes in the heart and other viscera.*

* The article KIDNEY was published in 1840, and since the publication of that article views entirely identical with those which I then stated and illustrated have been brought forward by some very recent writers, as previously unpromulgated by any other. I think it, therefore, due to myself to state, and to refer to the parts and the *sections* of this work, and to the *dates* where my statements as to the topics connected with albuminous urine and granular disease of the kidney, or *Cachectic Nephritis*, as I have termed this disease, may be referred to: the granular degeneration being the advanced stage of the cachectic inflammation. In 1832, I stated, when describing the states of the urine in connexion with dropsies, that "renal disease may exist without the urine being albuminous; and the urine may be albuminous without the kidneys being particularly implicated." Also, that I have often found the urine albuminous in the acute diseases of children, where no alteration of the kidneys existed; and that this condition of the urine is frequently observed after the exanthemata. (See *art.* DROPSY, § 34–36.)

When treating of the Diseases of the KIDNEY, in 1840, I entered very fully on the consideration of the pathology of the changes, which, when advanced, have been called "granular degeneration" of this organ; and showed that these changes, and consequently this degeneration, depend upon, or are intimately connected with, a morbid state of the blood; that, therefore, this particular disease of the kidney should be called, "*Cachectic Nephritis, Nephritis Cachectica; or Nephritis Sociata, associated or complicated Nephritis; or Nephritis from constitutional vice; or Nephritis from a morbid state of the blood, or Inflammation of the Malpighian bodies or tufts*," rather

133. In briefly adverting to *the association of disorder of the circulating, nervous, and muscular systems*, I need only remark that, when the chyle or blood is disordered, these other systems are all more or less affected—the muscular system chiefly through the medium of the nervous. Irritation of lymphatic or lacteal vessels, either at their origins, or by the fluids which they imbibe and transmit, affects the glands through which they pass, or in which they terminate. When the lacteals are irritated, especially at their origins in the small intestines, the irritation is often propagated to the mesenteric glands, or to the portal veins and liver. Indeed, the digestive mucous membrane is seldom affected, especially in children, without causing disease of the mesenteric glands, particularly if the malady goes on to ulceration. It has been believed that, not only under these latter circumstances, but also in chronic dysentery, more especially as it occurs in warm climates, the consecutive abscess of the liver, frequently met with, is not merely owing to the absorption of morbid matters, purulent or acrid, from the digestive mucous canal, which irritate or inflame the liver or its vessels, but is actually the result of a true phlebitis, commencing in the veins of the mucous surface, and propagated along the veins contributing to the portal system, and thence to the ramifications of the vena portæ. In disordered states of the blood, when this fluid becomes vitiated, not only the muscular system, but the joints are also often affected. I have already hinted at this connexion, as arising from the circumstance of the ganglial nerves not merely supplying the blood-vessels of the extremities, but also being distributed to the joints, in the vicinity of which they form minute ganglia; and hence, when the organic nervous system is much depressed or weakened, there is always great weakness of the joints. In this way may various phenomena that occur in many diseases be explained. Thus, gout and rheumatism arise not merely from the morbid condition of the blood, but also from the state of the organic or ganglial nerves supplying those parts, and from the connexion of these nerves with the cerebro-spinal sensory nerves.

134. V. SYMPATHIES OF SENSATION AND SENSIBILITY, OR ASSOCIATED STATES OF MORBID SENSATION AND SENSIBILITY. — After my endeavours to point out the intimate association of the ganglial with the spinal nerves and nerves of sense, it will be unnecessary to revert to the channel of communication in the associated affection of this class. It is only requisite to notice certain of these associations. Owing to the intimate connexion of the fifth pair of nerves with the nerves of sense—with the optic, lingual, auditory, and olfactory — a change affecting the roots or trunk, or even the ramifications of the fifth pair of nerves, to a certain extent impairs one or more of the senses on that side on which this nerve may be affected or implicated. Thus, in cases of tumour or abscess pressing upon the gangliated portion of the fifth pair of nerves, not only is the sensibility of the surface affected, but also the circulation and secretions of the organs of sense on that side are either disordered or impaired. Inflammation of the conjunctiva readily supervenes, and the senses of smell and taste are affected partly in consequence of diminished secretion from the surfaces of their respective organs. All the functions of sense are more or less affected, not only by disease implicating associated nerves, or parts from which the nerves take their origin, but often also by disease in distant situations. Even depressed energy of the organic nervous system generally, and especially of those parts of it which preside over digestion and assimilation, impairs the functions of sense. This association of remote organs—this unity of the frame—is displayed not only by one class of functions, but by all the manifestations of life in the different organs constituting the individual living being. I need not advert to the association of morbid sensibility of different parts of the cerebro-spinal nervous system. We are all aware that, when irritation exists at the origins of the nerves, it is not there that we may expect to find sensibility principally affected. When the irritation even is greatest at the roots of the nerves, little or no pain or alteration of sensibility may exist there: it will be felt chiefly at the sentient extremities of those nerves. This is manifested by *tic douloureux*, in which the morbid condition exists near the base of the brain, or is connected with the dura mater, or is caused by exostosis of some portion of the bones of the cranium. There may be pressure, or irritation caused by ossific deposits, but the morbid change is evinced principally at the remote or distal extremities of the nerves.

135. The same circumstance obtains with regard to the spine. In cases where the individual may not suffer the least uneasiness in the seat of pressure, or in any part of the spine, yet there may be extreme pain in the surface of some part supplied by nerves from that portion of the spinal cord which is implicated in the existing irritation or other change. Although the patient

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than the appellations conferred on it. (*See the Synonyms adduced under this head.*) And conformably with this doctrine I have defined the disease, *pathologically*, as follows: "*A morbid state of the blood, characterized chiefly by the presence of urea and deficiency of albumen and of hematosine, in connexion with lesion of the circulation in the minute glandular or Malpighian bodies and structure of the kidneys, with various organic changes in other viscera, and generally with serous effusion into the cellular tissue and shut cavities.* (See *art.* KIDNEY, § 81.)

I afterward proceeded to investigate and to describe various topics connected with the pathology, complications, and treatment of this malady, especially the particular tissue of the kidneys primarily affected; the connexion subsisting between this disease and morbid states of the blood; and between it and other visceral maladies, and the origin of the changes of the blood, on which this disease of the kidneys is consequent (*see* § 82). I next described the physical appearances and states, and the chemical changes of the blood in the several stages of the acute and chronic forms of this disease (§ 93–97); and afterward noticed the sources and causes of this state of the blood (§ 140, 141). I would most particularly refer to *par* 142 of that article, where the reader will find this topic explained, and the reason of both kidneys being always affected in Cachectic Nephritis.

Now Dr. FINGER, of Prague, Dr. WALSHE, and Dr. GEORGE JOHNSON, have, long after the publication of the article on the diseases of the kidneys, adopted my views as to this malady, without any reference to them whatever; Dr. FINGER stating that "the blood is first diseased;" and Dr. WALSHE (*Lancet*, July, 1849) that the lesions of the kidneys are the consequences of previous alterations of the blood. Still more recently, Dr. GEORGE JOHNSON, in his Gulstonian lectures (see *Medical Times and Gazette* for March and April, 1852), has adduced the same doctrine of the origin of this disease; and I am, therefore, entitled to conclude that the adoption of my views, and of the results of my investigations, by these very able pathologists, is a strong confirmation of their general accuracy. The several associations and complications of this malady, in connexion with the progressive changes of the blood and of the kidneys, were more fully described in that part of this work than they had previously been.

may not feel pain in the part especially affected, yet he may be suffering under inflammatory irritation, or congestion, or other organic changes implicating the spinal cord and membranes or the roots of the nerves. The suffering experienced in the extremities in gouty persons is not always owing to the changes in the extremities only, but partly also to congestion of the venous sinuses of the spine; and the partial palsy of the extremities, especially the lower, generally passing on to complete palsy, arises often from congestion of these sinuses, followed by effusion or other organic changes. These are facts which I have had occasion to verify in several instances by inspection after death. When the change implicating the cord, its membranes, or origins of the nerves, is such as irritate, excite, or similarly affect these parts, pain is usually manifested in the extremities of the corresponding nerves, and sometimes also by other nerves more or less intimately connected with them; but when the primary change goes on to the production of pressure, or to the destruction of parts, then loss of function, impaired sensibility, or difficult or impaired motion, or a combination of these, supervenes, and increases with the augmenting organic change.

136. Not only may irritation or pressure at or near the origins or roots of the nerves of sense and of motion affect the senses, the sensibility, and the motions, even to the remotest parts, but irritation, originating in or affecting the ganglial nerves, will produce serious disorder not only in the seat of irritation, but also in most distant places, which places often evince the chief disturbance, either in respect of their sensibility or their movements, or both. These occurrences are not unfrequently verified by post-mortem examinations, the existing lesion being sometimes found in parts which evinced but little or no disorder during life, the severity of the sympathetic affection having attracted the entire attention of both patient and physician. The irritation produced by a calculus in the kidney, by sabulous matter in the tubuli of the organ, often produces disturbance of the organs supplied with nerves from the ganglion and organic nervous plexuses of the organ, extending even to the associated ganglia, and affects not only the urinary functions generally, but also the digestive, occasioning nausea, vomiting, constipation, colicky pains, &c.; and the extent of disorder is sometimes even not so limited, but still farther extended. By means of the branches or fibrils of ganglial nerves proceeding from the renal ganglion to the roots of the spinal nerves, and even to the cord itself, as well as by means of spinal nerves proceeding to the sympathetic nerves and ganglia, a sympathetic affection — one consisting chiefly of pain, or morbid sensibility of a painful kind—is sometimes also experienced in various parts of the external surface, or in the course of a nerve, as it ascends to the shoulder or arm of that side, or more frequently down the lower extremity; occasionally with a peculiar numbness or imperfection of the voluntary movements. I have had opportunities of observing such cases, in some of which the pain was as severe as in neuralgia, where also the cause was suspected during life, and no appropriate treatment had previously been adopted. In two instances of recent occurrence, an examination was made after death, and large calculi were found in the kidney. Irritations of the ovaria or uterus, as will be noticed hereafter, develop even a still wider range of sympathies.

137. VI. SYMPATHETIC DISORDERS OF ANIMAL MOTION. — These are of great importance, and present the same relations as have now been pointed out; but I can only imperfectly advert to them at this place. Many disorders, even several that are seated in the abdominal cavity, may affect the locomotive functions; of this we observe daily proofs. Fæcal accumulations, or morbid matters, or worms, in the intestinal canal, often irritate the ganglial nerves, and the irritation is propagated to the roots of the spinal nerves, or even to the spinal cord itself, and is thence reflected by these nerves to the voluntary muscles, to the extremities, or to the external surface. In this way, chorea, infantile convulsions, and various symptomatic disorders, often of an anomalous character, implicating the muscles of voluntary motion, alterations of sensibility on the surface and in the extremities, various affections of the organs of sense, and many of the phenomena observed in cases of intestinal and gastric disease, are frequently developed. (See *arts.* CHOREA, CONVULSIONS, EPILEPSY, &c.)*

138. There are numerous sympathies or associated morbid states indicated in the *synopsis* or *classification* (§ 14) of the topics comprised in the very extensive subject here attempted to be discussed, but I must content myself with the mere indication of them thus afforded. The pathologist will readily recognise the importance of most of them, and the medical practitioner will readily furnish illustrations of them from his own experience. One of the chief objects I have in view is, to point out the principal channels of sympathy, or the media by which disorders become associated or complicated; the channels or media having been recognised, the resulting phenomena, as actually occurring in practice, may more readily be referred to their sources, although they are too various and numerous to be adduced and illustrated in the space to which I am limited. Passing over, therefore, some of the subordinate orders of sympathies, which may be ranked under the preceding classes, I shall conclude with a brief consideration of a class of sympathies to which sufficient importance has not always been attached, and which, indeed, has not always been rightly interpreted or understood.

139. VII. THE SYMPATHIES EVOLVED BY THE REPRODUCTIVE ORGANS appear about the period of approaching or fully-developed puberty. The influence of the sexual organs upon the economy is evinced at this period by the more rapid growth of the whole body, and by the more complete development of all the structures and organs, and of all the manifestations of mind; and this evolution of the physical and mental constitution of the individual is the more perfect and complete when, circumstances being favourable in all other respects, these organs have not been prematurely excited, exhausted, or abused; for accurate observation will confirm the position, that abuse, or premature excitement of these organs, or excess

* [For a very satisfactory description of the sympathetic disorders of animal life we must consult the recent works of MARSHALL HALL. In addition to the diseases mentioned as examples of spinal irritation, may be mentioned epilepsy, puerperal convulsions, tetanus, hydrophobia, hysteria, spasmodic asthma, tenesmus and strangury, abortion, spasmodic strabismus, spasmodic tic and torticollis, spasmodic respiration, &c.—(*See* M. HALL *on Diseases of the Nervous System.*)]

of such excitement, diminishes or weakens the growth of the body, or impairs the energy of both the organic and the cerebro-spinal nervous systems; and, with other injurious effects, often carried to an alarming extent, impairs or even altogether destroys the chief manifestations of mind, and develops several constitutional maladies and numerous special diseases, with their still more numerous sympathetic associations. The evil is not limited to the delinquent alone, but extends to the offspring of him or her who has indulged in the vices to which reference is now especially directed—if, indeed, such creatures be capable of reproducing their species. If this power be still retained, it is generally manifested weakly, imperfectly, and insufficiently, as regards the constitution, physical and moral, of the offspring.

140. While the perfection of mental and bodily function, as well as of corporeal development, thus results from the full evolution of the sexual organs, or from the reciprocal influence exerted between them and the nervous systems, numerous disorders, evincing more or less extensive sympathies and associations, are produced by the causes now alluded to—by abuses of these organs. The exhaustion thereby caused affects not one organ merely, but the whole frame. This generally extended sympathy—this universally diffused state of disorder—is to be explained partly by the exhaustion consequent upon inordinate excitement, and partly by the excessive secretion and excretion of a recrementitious fluid—of a secretion intended not merely for the perpetuation of the species, but also for the support and development of the structures, and of the nervous power of the individual. This functional abuse extends its consequences thus generally, through the medium of both the organic and the cerebro-spinal nervous systems, impairing digestion, vital action and tone, sensation, perception, memory, volition, muscular motion, &c., and hence all these functions not merely languish, but also betray, in varying forms and associations, numerous sympathetic disorders, increased susceptibility of impressions, morbidly increased irritability, &c., while nervous power, and endurance, and vital resistance are diminished. Impaired assimilation and nutrition, and a general cachexia, are also among the usual results, even when no particular or specific form of disease is developed. Ultimately, the organs thus prematurely or inordinately excited either have their functions entirely exhausted or assume an increased susceptibility of irritation, and become the seats either of very frequent or constant disorder, or of organic lesions, whence numerous sympathies irradiate. The morbid state of one of these organs partially extends to all; that of the ovaria affects the uterus and the mammæ, or that of the latter extends to the former. Irritation of either of these organs extends through the medium of the ganglial nervous system to the urinary organs, to the digestive canal, and to the secreting and excreting organs generally. Thus we perceive disorders supervene of the secretion or excretion of urine, flatulence, borborygmi, the globus hystericus, with other affections of the bowels and stomach, and even interruptions of the cutaneous, biliary, and intestinal secretions and excretions.

141. These disorders are almost universally experienced in these circumstances, and as the irritation of the sexual organs increases either in duration or intensity, or as the causes which occasion the irritation are persisted in, the sympathetic disturbances advance still farther and more generally by means of the nervous communications already described; and ultimately, in consequence of superinduced alterations of the vascular system and circulating fluids, they are manifested in numerous modes in distant parts of the economy. The individual who has thus devoted himself or herself—it may be said to the infernal gods—soon afterward, and owing to the sympathy manifested by the ganglial system, complains of palpitations or irregularities of the heart's action, of shortness of breathing, and other signs of pulmonary or cardiac disease, of indigestion or morbid states of the appetite, and of various anomalous pains or alterations of sensibility in different parts of the body. Owing to the connexions subsisting between the organic nervous system, the spinal nerves and cord, and the brain and nerves of sense, and owing to the association of the ganglial and spinal nerves in the organization of the reproductive organs, disorder in various forms is extended to, or is manifested by, the organs of sense, and the muscular and tendinous structures. Volition is often languidly or imperfectly transmitted by the voluntary nerves; the muscles become more and more unable to execute the weak or inadequate volitions; the fibrous and tendinous structures evince impaired vital tone, while sensibility and irritability present various aberrations. In conjunction often with these, or more or less independently of some of them, various congestions in different places, either in succession or coetaneously, or irregular distributions or determinations of blood, take place, and either heighten preceding ailments or develop novel forms or combinations of disorder. Congestions of the venous sinuses of the spinal column frequently occur, and disorder the urinary functions or affect the sensibility or movements of the extremities, producing partial, or even complete palsy, either of sensation or of motion, most frequently of the latter. The irritation existing in the primary seat of disorder is often propagated to the roots of the spinal nerves or to the cord itself, and is thence reflected upon the surface of the body, or in the extremities, in the form of neuralgia, or in other states of altered sensibility, or in various forms of hysterical spasm, convulsion, or disorders of motion. The senses, especially sight, hearing, and touch, are variously obscured or modified, and the mind becomes more or less disordered. The individual whose organic and mental energies have become weakened by the causes alluded to, is envious of those who possess powers which he either never had or has lost; is censorious; indulges in scandal or in the depreciation of others; is mean, spiteful, or sanctimonious; or he becomes the subject of some variety of partial or even of general insanity, or of idiocy and general palsy.

142. The most dangerous and advanced maladies resulting from the morbid condition referred to—the most serious and complicated mischief thus produced—varies with the constitution, predisposition, and concurring causes and circumstances affecting the individual. In many, asthmatic or pulmonary affections, tubercular consumption, and tubercular formations in different organs; in others, various forms of insanity; in some, organic disease of the heart; and in some, structural change in the brain or its membranes, occasioning epilepsy, palsy, &c., are the more re-

mote consequences. Indeed, almost every form of special disease, with their numerous sympathetic associations, may be simulated, and actually produced, especially when aided by concurring causes, when irritation of the reproductive organs is either frequently repeated or inordinately perpetrated. At first numerous functional disorders are developed, which are continually changing their aspects and their associations, and varying in severity and character. Subsequently, and as these are neglected, or as the cause is continued, or as the original morbid condition increases, disorders which were formerly functional become ultimately organic or structural, chiefly in consequence of the influence which disordered states of organic or cerebro-spinal nervous influence exert upon the vascular actions, upon the assimilating and nutrient functions, and upon the several secreting and excreting organs.

143. Having thus attempted to direct attention to the sympathetic relations of disease, and to the channels through which diseases become associated or complicated—my limits, however, obliging me to leave many topics connected with the subject altogether untouched—I wish to impress upon the reader the advantages to be derived in practice, from tracing, as accurately as possible, the bonds of connexion which associate or complicate the more specific and primary states of disease, and render morbid phenomena often difficult of interpretation, and as often difficult of removal. Having ascertained as accurately as possible the primary source of disorder; having traced the succession as well as relations of morbid manifestations, and the connexion of the whole with antecedent and existing causes; having, moreover, considered the probable extent of nervous disorder and of vascular disease, and of alteration or contamination of the circulating fluids, a rational basis is thereby formed for therapeutical indications and remedial measures; and, as respects both the general intentions and the particular means, these will be the more appropriately and successfully adopted.

144. I believe that the physician who thus enters on the study of each case which comes before him, and endeavours to connect the effects presented to his view with their causes, and to trace the bonds of union subsisting between those frequently distant effects, will generally exercise his profession successfully and honourably; for, being acquainted, as he should undoubtedly be, with the nature and operation of the remedies he employs, he will apply them appropriately to the removal of those morbid conditions which he rationally infers to be present. A physician whose mind is thus tutored and practically engaged will be neither skeptical of the effects of medicine on the one hand, nor empirical and rash in the use of it on the other. This extensive and practical knowledge, being always appropriately applied, will prevent him from lapsing into a skepticism which, entertained by any member of our profession, is not degrading to the profession itself—for truth and honour cannot be degraded—but which is most degrading to a skeptic himself, inasmuch as he admits himself to be deluding the public, while he boasts that he is not himself deluded, and thus vaunts his own dishonesty. Neither will the enlightened and rational physician lapse into a state of blind empiricism, and wield the weapons employed against disease in such a manner as will not only endanger the life of the patient, but also injure his own reputation.

145. I have been anxious to entertain the subject now imperfectly discussed, because it has hitherto failed of obtaining an attention in any way commensurate with its importance My limits have obliged me to omit several topics more or less intimately connected with it. The observations, therefore, which I have offered will, I hope, be viewed as *suggestive* only, especially in respect of various subordinate topics, for as my space did not allow me to illustrate, I could suggest merely.

[Most of the sympathetic phenomena, in health and disease, appear to us to depend on known laws of action of the cerebro-spinal nerves, independent of the sympathetic, as those of the radiation and coincidence of sensations, and of associated and reflected motions, &c. Where, *e. g.*, secretions take place in distant parts, in consequence of impressions on sensitive nerves, the brain and spinal cord, as MÜLLER states, are probably the mediums of communication, as where sweat is brought on by drinks. But where, in a secreting membrane, an impression made on one part is extended to the whole, as by an enema, the phenomenon is best explained by the communication of organic fibres with each other; and we have an instance of reflected action of the organic fibres of one part upon those of another, where inflammation of one organ gives rise to a similar condition in another. The *vegetative influence*, as MÜLLER calls it, is distributed to the organs through the medium of the ganglia of the sympathetic, as when inflammation of the eye is caused by an injury to the first cervical ganglion; and this radiating influence is in a certain degree independent of the brain and spinal cord, as the embryo may be developed while the brain and spinal marrow are destroyed. The latter are, however, as MÜLLER states, the main source whence the power of the organic nerves is gradually renovated. This is shown by the fact that certain affections of the brain and spinal cord, attended with paralysis, are likewise productive of atrophy. We are, however, as yet in the infancy of our knowledge regarding the functions of the sympathetic or ganglionic nerves; so much so, that MAGENDIE hesitated to regard it as a nerve. For the best account of its motor action, and its organic functions, as well as the sympathies, generally, we are indebted to the researches of MÜLLER.—(See *Elements of Physiology*, Am. ed. By J. BELL. Phil., 1843.)]

BIBLIOG. AND REFER.—*Fracostorius*, Liber de Sympathia et Antipathia Rerum; Opera, P. i., p. 1; et Theatrum Sympatheticum, p. 651.—*A. Jessen*, De Sympathia et Antipathia Rerum Naturalium Causis. Witteb., 1599.—*Peucer*, Oratio de Sympathia et Antipathia Rerum in Natura, 8vo. Francf., 1574.—*Schwelling*, Disser. Sympathiæ et Antipathiæ Historia physice explicata. Brem., 1682.—*T. Willis*, Pathologiæ Cerebri et Nervosi Generis Specimen, in quo agitur de Morbis Convulsivis, &c., Opera, 4to. Amsteld., 1682.—*S. Rattray*, Aditus novus ad Sympathiæ Causas, 8vo. Glasgow, 1658.—*J. A Endter*, Theatrum Sympatheticum in quo Sympathiæ Actiones exhibentur, 12mo. Norimb., 1660.—*F. Bayle*, Dissertationes Medicæ tres; de Sympathia partium cum utero, &c., 4to. Tolos., 1670.—*P. Brisseau*, Traité des mouvemens Sympathiques, &c., 12mo. Montp., 1692.—*H. M. Herwig*, The Art of Curing Sympathetically, &c., 12mo. London, 1700.—*H. J. Rega*, De Sympathia potissimum ventriculi in statu morboso, 8vo. Haerl., 1721.—*J. Crawford*, Practical Remarks on the Sympathy of the Parts of the Body (Edin. Med. Ess., vol. vi.), 8vo. Edin., 1740.—*Harmens*, Sympathiæ Explicatio, &c. Holms., 1741.—*Lansel de Magny*, Traité de la Sympathie des Parties du Corps dans les Maladies, 8vo. Paris, 1771.—*T. Kirkland*,

A Treatise on Child-bed Fevers, with a Dissertation on Sympathy, &c., 8vo. London, 1774.—*R. Whytt*, Works, 4to. Edin., 1768.—*B. Waterhouse*, Dissertatio de Sympathia, 4to. Lugd. Bat., 1780.—*Kretschmar*, Darstellung der Wirkungen der Arzneyen, B. i., p. 153, 162.—*A. Vater*, De Consensu Partium Corpor. Hum , 4to, Viterbo, 1741; et in *Halleri*, Disput. Pathol., t. ii , No. 45.—*J. H Schulze*, in *Halleri*, Disput. Pathol., t. vi., No. 219.—*D. Langhans*, in Ibid., t. vi., No. 220.—*E. Platner*, Diss. de Causis Consensus Nervorum Physiologicis, 8vo., Leipz., 1790, et in *Ludwig's* Script. Neurol., t. ii.—*S. H. Jackson*, A Treatise on Sympathy, 8vo. London, 1781.—*M. W. de Neufville*, Versuch einer Praktische Abhandlung von der Sympathie des Verdaungs Systems, 8vo. Gott., 1786.—*J. P. Michell*, De Sympathia inter Caput et partes Genitales (Schlegel, Opusc. de Sympathia, part iii.), 8vo. Lips., 1787.—*J. C. Schlegel*, Sylloge Opusculorum de Sympathia, 8vo. Lips., 1787.—*D. Veegens*, De Sympathia inter Ventriculum et Caput (Schlegel de Sympathia), 8vo. Lips., 1787.—*Fremling*, De Sympathia et Antipathia. London, 1789.—*J. H. Rahn*, Exercitationes de Causis Physicis Sympathiæ, 4to. Turici, 1788.—*J. H. Rahn*, De miro inter Caput et Viscera Abdominis Commercio (Ludw. Script. Neur., iv.), 4to. Lips., 1795.—*D. Veit*, De Organorum Corporis Humani Energia et Sympathia, 8vo. Hal., 1797.—*F. P. Charmeton*, Essai Médical sur les Sympathies, 8vo. Paris, 1803.—*P. I. Roux*, Mémoire sur la Sympathie, in Mélanges de Chirurg., 8vo. Paris, 1809.—*A. H. F. Gutfeldt*, Ueber das Verhältniss der Wechselerregung, Nervenwirkung, &c., 8vo. Goett., 1803.—*C. Rocher-Deratte*, Mélanges de Physiologie, &c., contenant un Traite sur les Sympathies, 8vo. Paris, 1803.—*G. M. R. Luzuriaga*, Von der Wechselseitige Thätigkeit des Blutes und Nervensystems, 8vo. 1804.—*J. P. Michell*, Ueber die Mitleidenheit der Geschlechtstheile mit dem Kopfe, 8vo. Wien., 1804.—*J. Loew*, Ueber die Sympathetische Wirkung der Dinge, 4to. Landrh., 1809.—*P. I. Roux*, Mémoire sur la Sympathie (Mélanges de Chirurg.), 8vo. Paris, 1809.—*R. H. J. Dutrochet*, Théorie nouvelle de l'Habitude et des Sympathies, 8vo. Par., 1810.—*F. Hufeland*, Ueber Sympathie, 8vo. Weim., 1811.—*A. Wilson*, Practical Observations on the Action of Morbid Sympathies, 8vo. Edin., 1818.—*Barthos*, Nouv. Elémens de la Science de l'Homme, Journ. Génér. de Méd., t. xxv., p. 312.—*Dutrochet*, Nouvelle Théorie de l'Habitude et des Sympathies. Paris, 1820.—*F. Hufeland*, Ueber Sympathie, 8vo, Weimar, 1811; et Bibliothek der Pract. Heilk. Sep., 1811.—*Barthos*, in London Med. and Phys. Journal, vol. xlv., p. 246.—*R. Harrison*, in Ibid., vol. xliv., p. 105.—*Alison*, in Transact. of Med. and Chirurg. Society of Edin., vol. ii., p. 165.—*I. A. Unzer*, The Principles of Physiology, transl. by *T Laycock*, for the Sydenham Society, *pluries*.—*G. Prochaska*, On the Functions of the Nervous System, in Ibid. London, 1851.—*A. F. Stauffer*, Sympathie des Menschen, 8vo. Constanz., 1819.—*Monfalcon*, Dict. des Sc. Méd. (art. *Sympathie*), t. liii. Paris, 1821.—*M. Fodera*, Recherches sur les Sympathies, &c., 8vo. Paris, 1822.—*F. M. Gelcen*, Des Sympathies des, Organs du Corps Humain, 8vo. Paris, 1822.—*P. Reis*, Des Sympathies considérées dans les différens Appareils d'Organes, 8vo. Paris, 1825.—*Adelon*, Dict. de Méd. (art. *Sympathie*), t xx. Paris, 1828.—*C. Lambert*, Examen Médical des Sympathies, 8vo Paris, 1825.—*I. M. A. Michu*, Des Sympathies Morbides, et des Phénomènes Secondaires dans les Maladies, 4to. 1830.

[Am. Bibliog. and Refer.—*Martyn Paine*, The Institutes of Medicine, 8vo.—Med. and Phys. Commentaries.—*S. H Dixon*, Essays on Pathology and Therapeutics.—*D. Hosack*, Essays on various Subjects of Med. Sci., 3 vols. 8vo.—Am. Ed. of *C. W. Hufeland's* Enchidion Medicum, the Result of 40 Years experience, 12mo.—*S Jackson*, Principles of Medicine, founded on the Structure and Functions of the Animal Organism, Nervous System, Documents and Dates of Modern Discoveries in the Nervous System, by Walker, Bell, Magendie, Whytt, Prochaska, Hall, Müller, Copland, &c., 8vo. Phil.—*E. North*, Outlines of the Science of Life, 8vo —*Benjamin Rush*, Med. Inquiries and Observations, 2 vols. 8vo.—*J. Stewart*, On Diseases of Children.—*Condie, Meigs, Eberle*, On Diseases of Children.—*W. Sweetser*, Treatises on Consumption and Digestion, and on Mental Hygiene.—*J. Thacher*, American Modern Practice, 8vo.—*C. Ticknor*, On Medical Philosophy, 12mo.—Essays on Practical Medicine and Surgery, by Drs. Chapman, Bache, Coates, Giddings, Griffith, Mitchell, Wood, Dunglison, Condie, Dewees, Hays, Jackson, Patterson, Hodge, Horner, &c., 2 vols. 8vo.—*W.* and *D. Griffen*, Observations on Functional Affections of the Spinal Cord and Ganglionic System of Nerves, in which their identity with sympathetic, nervous, and imitative Diseases is illustrated, 8vo.—*George B. Wood*, A Treatise on the Practice of Medicine, 2 vols.—Am. Ed. of Müller's Physiology. Phil., ed. by J. Bell.]

SYMPTOMATOLOGY, *comprising* Diagnosis *and* Prognosis.—Synon.—*Symptomatology*, *Symptomatologia* (from συμπτωμα, a symptom, and λόγος, a treatise); *Semeiology* (from σημεῖον, a sign); *Semeiologia—Semeitice; Symptomatologie, Semeiologie, Semeiotique*, Fr. *Die Zeichenlehre, die Symptomatologie*, Germ.

Diagnosis.—Synon.—Διαγνωσις (from διαγνωσκω, I distinguish); *Diagnostics; Diagnostic; Diagnose*, Fr. *Kennzeichen, Erkennung der Krankheit*, Germ. *Diagnostica*, Ital.

Prognosis.—Synon.—*Prognosis* (from προ, before, and γινωσκω, I know); προγνωστικον, Hippocrates; *Præcognitio, Prænotio, Præscientia, Prædictio*, Auct. *Prognostic*, Fr. *Die Vorhersagung, die Prognose*, Germ.

Classif.—General Pathology.

1. In the article Disease, I gave an ample sketch of the *Causation of Disease*, or *Etiology*, not only mentioning the several occasions of disorder, but also arranging them and showing their modes of operation. I afterward considered the *general doctrine of disease*, or Pathogeny, and described the changes constituting disease, as they proceeded more immediately from the causes producing them; noticing in succession the simpler or dynamic changes, the more complicated or qualitative alterations, and the effects of these changes upon the secretions and excretions, upon the circulating fluids, and upon the nutrition of the several structures. After a sufficient consideration of the numerous topics comprised under these heads, I noticed the *Procession and duration of morbid phenomena*; the *Types or forms of disease*; the *Terminations of disease*; the *Relations, successions, and complications of disease*; the *Metastases or conversions of disease*; and, lastly, the *circumstances modifying the Form, complication, duration, and termination of disease*. I thus developed, under the article Disease, a *system of pathology*, which, in certain of its parts, is more fully illustrated in the several articles on special topics—on the *blood*, on the *structural lesions* of the several tissues and organs of the body, &c.; and which, when connected with others, and with the article now commenced, will furnish the reader with comprehensive views of morbid actions, will demonstrate the relations and connexions of these actions, and will enable him to arrive at rational conclusions as to their natures, and as to the indications and the means most appropriate for their removal, for their alleviation, or for their control. Having discussed the numerous topics referred to, I have now to notice the *symptoms and signs* by which the *forms and states of morbid action* are recognised and duly estimated, especially as respects the *seats*, the *natures*, and the *results* of such actions.

2. A knowledge of disease comprises not only a recognition of existing symptoms and signs, but also a due estimation of the value, importance, and source of each, the comparison of one with the others, the relations subsisting between them, the connexions between them and their antecedents and causes, and the results which may be expected from them, and their various combinations and groupings. In estimating the importance of symptoms, as showing the seats, the limitations, and issues of morbid action, they require due consideration both in the aggregate and individually, and not merely as regards the associations they present, but also as respects the absence of others, which are indicative of the seat, nature, extension, or issue of other special diseases, or of distinct but allied or similar states of

morbid action; absent manifestations of disease should be taken into account in our estimation of the value or importance of those which are present.

3. *The manifestations of disease*—the symptoms and signs by which the seats and natures of diseases are indicated—are, 1st, vital or spontaneous, or strictly sympathetic and symptomatic; or, 2d, physical or artificial. The former of these only are comprised in this article; the latter have been fully discussed in the articles Abdomen, Auscultation, Chest, Succussion, &c. In treating of *the Sympathetic and Symptomatic Manifestations of disease*, or of *Symptoms* more especially, I shall, *first*, notice those which appertain to the *appearance* and *attitude of the body*, and to the *Animal, Locomotive, and Sensory functions; second*, those which belong to the *Respiratory and Circulating Organs; third*, those which are manifested by the *Digestive and Assimilating Organs*; and, *lastly*, those which concern the *Urinary and Sexual functions and organs*.

4. I. Symptoms and Signs appertaining to the Attitude and Appearance of the Body, and of the Animal Functions.—Numerous changes in the attitude and appearance of a patient at once strike the experienced observer, and suggest a general and often a correct idea of the nature of the disease which he is called upon to treat.—i. The Attitude and general Appearance of the Body furnish signs both of the nature and of the tendency of the disease. A constantly retained position on the back indicates depression of vital power, and in febrile diseases extreme exhaustion or asthenia. It is most remarkable in low, typhoid, adynamic, or pestilential fevers, and in the last stage of acute maladies, especially when, with extreme exhaustion of organic nervous power, there is either low or muttering delirium, or unconsciousness, or coma, or more or less contamination of the circulating fluids. When this position is long retained, especially without due attention to cleanliness or dryness of the surface, the more prominent parts, or those most pressed upon, become inflamed, ulcerated, or gangrenous; and the results are often fatal, unless the local and constitutional treatment be active and appropriate. If this position be attended by a sinking or falling down in bed, owing to a tendency of the body to gravitate to the lower or more depending parts of the bed, and to lost power of the extensor muscles, the positions of flexible parts being somewhat bent, and the head gravitating in the direction where the support is the least, the exhaustion of vital power and the consequent danger are the greatest, especially in the maladies just named. When the patient becomes capable of recovering his position when he feels himself falling down in his bed, or falling from his pillow, and especially when he is able to turn to either side, and to retain for a time a position on his side, or even partially on his side, it is one of the earliest indications of returning powers in low or adynamic febrile maladies. The supine position, with the knees drawn up, so as partially to relax the abdominal muscles, and to keep off the pressure of the bed-clothes, indicates morbid sensibility or inflammation, or both, of one or more viscera in the abdominal cavity, and more especially peritonitis, enteritis, gastritis, &c. In these cases, the supine position is retained, not so much in consequence of exhaustion, as in order to remove the pressure of the contiguous viscera from the diseased parts.

5. The sitting attitude, the inability to lie down in bed, the necessity of being shored up in bed, and various sitting positions, are important indications of the diseases to which the physician's investigations should be particularly directed. The sitting position can hardly be relinquished in dyspnœa, asthma, in organic diseases of the heart, in extensive effusion into the pleural cavities, in bronchitis of both lungs, in laryngitis, in many cases of congestive or asthenic pneumonia, and in severe or complicated cases of epidemic influenza. In the worst states of these especially, the patient is unable to repose on either side without great increase of his sufferings, inasmuch as the weight of the upper regions of the trunk upon the side on which he rests greatly impairs the respiratory functions of that side, while the action of the side left free is insufficient for the respiratory changes, and for the purposes of the economy. In less severe or urgent cases, the patient retains a semi-supine position, by having the shoulders and head elevated by pillows. In the more extreme cases of these maladies, the patient is obliged to lean forward, and often to place his elbows or arms on the table in order to procure a fixed point for a stronger contraction of the muscles of respiration. In protracted cases of this kind, the shoulders acquire an unnatural elevation, and are directed upward and to the ears.

6. A restless mode of lying down accompanies severe states of thoracic inflammation and acute rheumatism, and several organic maladies. A quiet position on lying down, with perfect consciousness and returning strength, indicates a favourable termination. This position, however, is retained in rheumatism in order to avoid the pain occasioned by removing. Lying on the abdomen, and tossing from the prone to the supine position, or from side to side, attend violent colicky pains, and ileus, or the passage of gall-stones, and hysteria. Patients often prefer to lie on the right side in health, and generally in pneumonia, in bronchitis, and in cases of pleuritic effusion of this side, after pain, or the more acute symptoms have subsided; also in splenitis and psoitis of the left side. They generally lie on the left side in pneumonia, bronchitis, and when effusion has taken place into the pleura of this side, and the pain has ceased. At the commencement of pleurisy, patients lie either on the back, or in the semi-recumbent position, or on the side opposite to that affected, while the pain continues, and before effusion has become great; they also frequently prefer to lie on the back, or in a raised position, in organic affections of the heart and large vessels.

7. ii. The Expression of the Face and state of the Features.—The facial expression is of great importance in recognition, diagnosis, and prognosis of disease; and sometimes, especially in *children*, it is the chief means of evincing the nature of the malady. In them the appearances of the countenance may be observed with advantage while they are asleep, as well as when they are awake; and, in many cases, it is of use to observe the expression immediately upon awakening them. Although the experienced observer will be guided in his diagnosis by the expression of the face of children, yet he will generally find great difficulty in describing the appearances which thus influence his opinion.—*a*. The knit-

ting of the *brows*, or frowning, in children usually indicates inflammatory irritation of the brain or membranes, or of both. And with this expression is often conjoined a contraction or approximation of the eyebrows and zygomatic arch. Relaxation of these parts, with a relaxation, drooping, or falling of the eyelids, is a sign of vital exhaustion, or of effusion or pressure on the brain.

8. *b.* A *dark circle* surrounding the eyes, and most remarkable beneath the eyes, often with more or less sinking of these organs into their orbits, is often observed in connexion with organic diseases, especially those of a malignant or contaminating nature. It is also very manifest in females who are subject to uterine or ovarian diseases, or to severe or prolonged leucorrhœa, or who addict themselves to masturbation. A *puffy or œdematous* appearance of the eyelids, or below the eyes, is observed in diseases of the heart, especially those implicating the valves, and in granular lesions of the kidneys, as well as in connexion with several forms or seats of dropsy. Sudden or rapid *sinking of the eyes* inward, with increase of the dark circle surrounding the eyes, is a most remarkable and most unfavourable sign in the stage of collapse of pestilential cholera, in an advanced stage of adynamic, hectic, and malignant fevers, and in the last or most unfavourable periods of gastritis, enteritis, dysentery, and of purulent, tubercular, or cancerous contamination of the circulating fluids.

9. *c.* The *nose*, especially in connexion with the *cheeks*—the *nasal* and *genal* expression—furnishes much information as to the seat and issue of disease, especially in children. A pinched appearance of the nose, with a retraction or dimpled state of the cheeks, often is observed in an advanced, or in an unfavourable course of diseases of the digestive organs; and a remarkable dilatation and contraction of the alæ nasi—a working of the nostrils, with or without a retraction of the angles of the mouth—attend not only the most dangerous forms or stages of disease of the respiratory organs, but most of those maladies in which the organs of respiration become more or less implicated at an advanced period, or towards a fatal termination. In severe or dangerous inflammation of the diaphragm, or of the serous membranes reflected over this part, those signs are most prominently manifested. The alæ nasi and cheeks are drawn upward and outward in the most painful and spasmodic affections of the digestive canal and diaphragm, especially in spasmodic gastralgia and enteralgia, in cholic, ileus, and during the passage of biliary calculi.

10. *d.* The *lips* and *mouth*, with the chin, furnish important indications—the *Labial signs.*—Retraction of the corners of the mouth, so as to produce the sardonic grin, is very remarkable when the diaphragm is inflamed or implicated in the manner just now stated, and in very painful and dangerous affections of the stomach, bowels, and tendinous aponeurosis. The lips are thin, retracted, or apparently stretched over the teeth and gums, in the last stage of hectic, especially when caused by pulmonary disease; the actions of the nostrils being also remarkable and unnatural. The face in these cases, particularly when emaciation has made great progress, is pinched in, retracted, and diminished, the chin becoming sharper and more prominent. The lips often are surrounded by a dark circle in chronic affections of the stomach, bowels, or liver. The lips lose their ruddy hue, or become more or less *pallid*, in anæmia, however produced, after hæmorrhages, in chlorosis, in diseases of the spleen, and in uterine and ovarian maladies. They often, at the same time, present a less erectile or tumid appearance, and are more disposed to crack, or become irritated or sore. Soreness of the lips, and eruptions on them externally, are frequently observed in the course of chronic affections of the digestive canal and abdominal viscera, especially in children at a far-advanced stage of those diseases. The lips are often similarly implicated, but in a slighter degree and in a more fugitive manner, in connexion with catarrhal affections. They often *swell*, especially the upper lip, in connexion with latent or developed scrofula and tuberculosis, and in cases of intestinal worms. A *dark* or a *purple hue* of the lips is generally present when the blood is imperfectly changed to the arterial state, owing to disease of the lungs or heart, or of the respiratory passages, especially congestive bronchitis and broncho-pneumonia, or to effusions of fluid into the thoracic cavities. When this change of colour is observed in those maladies, it ought always to be viewed as a most dangerous appearance.

11. *e.* The *general expression* of the countenance may be bashful, downcast, painful, anxious, terrified, enraged, or joyful. A bashful, downcast appearance, or an inability to look the person addressed fully in the face, is a certain indication of nervous exhaustion by masturbation and of impotency. This down-look in patients complaining of chronic disorders, or of diseases of debility, at once indicates the cause in which they have originated. The expressions of pain and anxiety are readily recognised in connexion with pain, extreme soreness, difficult respiration, palpitations of the heart, injuries, and inflammations of vital organs or parts. The expression of terror or extreme fear is observed chiefly after severe or dangerous accidents or operations, during excessive hæmorrhages, in rabies, in delirium tremens, and insanity. The expression of rage occurs chiefly in mania, rabies, phrenitic delirium, and monomania. The countenance is vacant or unconcerned in true hæmagastric pestilence, when it becomes also of a pale lemon colour, in amentia or idiocy, and in general paralysis. It is tumid or bloated, all the features often appearing enlarged and exaggerated, in congestive and sanguineous apoplexy, in obstructive circulation from disease of the heart or valves, and in connexion with dropsical effusions from such disease, and from diseased kidneys.

12. *f.* The *tint, hue,* or *colour* of the countenance furnishes important signs of disease. A pallid or anæmied hue of the countenance attends deficiency, thinness, or poverty of blood, especially when observed in connexion with pallor of the lips, gums, and tongue; this state of the circulating fluid being either a primary ailment, or variously associated, or consecutive of numerous maladies—being thus either a *primary*, an *associated*, or a *consecutive anæmia*. *Primary* owing to inanition, to want of sunshine, light, and pure air: *Associated* with torpor, inactivity, or exhaustion of the sexual organs, and characterized by a pale greenish yellow tint of the face, as in chlorosis; with disease of the uterus or ovaria;

with tuberculosis of the mesenteric or bronchial glands, with disease of the spleen, or with wasting or structural lesions of the testes: *Consecutive* of all fevers, of acute rheumatism, of inflammatory and structural diseases of the digestive organs, and of the absorbent system, and of tubercular and cancerous maladies.

13. A *dark, lurid*, or *murky* tint of the countenance is commonly attended by a similar hue of the general surface, especially in low, adynamic, typhoid, or malignant forms of fever. It indicates a morbid condition of the circulating fluids, the blood being more or less contaminated and insufficiently changed from the venous to the arterial state. Along with this hue other tints may be associated, as that of *lemon tint*, as in the hæmagastric pestilence, the features still retaining their fulness or plumpness; or a deeper *yellow* or jaundiced hue, as in severe bilious remittents, the features being more or less sunk; or a *greenish yellow*, or dark *green hue*, when the liver and biliary passages are completely obstructed, or the former disorganized throughout. A continued *sallowness* or *murky pallor* of the countenance is commonly an attendant upon torpor and chronic affections of the liver, and upon disease of the spleen. The face, the general surface, and especially the extremities and nails of the fingers and toes, assume a *leaden* or *lurid tint* in the stage of collapse of pestilential cholera; and this tint often becomes deeper and darker as the patient sinks, the features being collapsed, and the eyes sunk deep in their sockets. A livid hue of the countenance, most remarkable in the lips, and commonly with lividity of the nails and fingers, occurs in the last stage of pneumonia and general bronchitis, in congestion of the lungs, in obstructive diseases of the heart, and in dropsy of the thoracic cavities; and it is always a most dangerous, and generally a fatal sign.

[The *yellow* colour of the tissues depends on two very different causes: 1st, the bile-pigment, which is met with in cases of jaundice, where it accumulates in the blood and passes thence into all the fluid secretions, colouring all the solid and fluid parts of the body; 2d, a change of the hæmatin of the blood when extravasated, as by blows, and in sugillations, pulmonary and cerebral apoplexy, and similar morbid processes. In the former instance, we sometimes observe under the microscope, that the tissues are merely saturated with a yellowish fluid, while at other times we discover a firm, granular, accumulated deposition, of a deep yellowish red colour, between the interstices of the primary histological elements of the tissues. Independently of icterus, the elementary cells of the liver frequently appear to be tinged yellow, and to be filled or covered with minute deeply yellow granules.]

14. A *pink hue* of the cheek, or a *pinkish red*, sometimes limited to the more prominent part of the cheek, is usually seen in hectic, especially the hectic of pulmonary disease. A generally diffused redness of the face attends inflammatory fevers, and is often observed during inflammation of the lungs, and occasionally in phrenitis. A persistent redness of the face sometimes occurs in persons advanced in life, who are accustomed to live fully or to drink port-wine too freely, the features being usually at the same time large or developed. Redness of the face, with unusual fulness of the features, is often present in sanguineous apoplexy. The redness of the features which accompanies eruptive fevers is readily distinguished by the history and circumstances of the case, by the pulse, and by the state of the general surface. A circumscribed patch of redness on one or on both cheeks is sometimes observed in chronic visceral diseases, and in low or hectic fever attended by alteration of the blood.

15. *g*. The *size* of the features generally—of the whole face—is often very considerably altered in disease. It is apparently *augmented* in sanguineous or congestive apoplexy, in acute mania, in phrenitis, and in convulsive diseases, especially epilepsy, in obstructive diseases of the heart, particularly those accompanied with dropsy, in acute and congestive pneumonia, and in the acute states of vascular action, observed in the hot stages of fevers—periodic, continued, or exanthematous. The size of the face is *diminished*; the features being shrunk or pinched, in the cold stage of periodic fevers, in pestilential cholera, in advanced states of visceral disease attended by emaciation, especially of phthisis and of hectic fevers. When the shrinking of the features becomes very remarkable in the advanced stages of either acute or chronic maladies, or approaches to what has been termed the *facies Hippocratica*, it is always a most unfavourable, and commonly a fatal sign.

16. iii. State of the General Surface of the Body.—*A*. The *colour* or *hue* of the surface frequently partakes of that of the countenance. Where the latter is ruddy, healthy, and animated, the former is neither altogether pallid or white, nor dusky, lurid, or dark, unless in the darker races. In the European, particularly of northern latitudes, the hue of the surface is that of white animated by a slight tint of carnation or pink. In the anæmied and chlorotic, and often in the leucophlegmatic and anasarcous, it is pallid, or a dead white, sometimes slightly tinted by yellow or pale yellowish green. The colour of the skin is more than naturally sallow, pallid, or murky in functional and organic diseases of the liver, spleen, often in chronic diarrhœa and dysentery, in obstructions of the mesenteric glands, and sometimes in organic diseases of the uterine organs. In the several forms of jaundice noticed above (§ 13), the hue of the general surface is yellow, of various grades to a yellowish green, or even to a murky or deep green. A pale yellow or lemon tint, with greenish or livid streaks or patches as the malady advances, characterizes hæmagastric pestilence; while a jaundiced yellow often attends remittent fevers, the tint becoming more deep or lurid as the disease assumes more and more of a putro-adynamic character. The hue of the surface is dark, dirty, or lurid in continued fevers of an asthenic or adynamic type; and it becomes darker or more foul as the disease advances, and as the powers of life sink. In the cold or formative stage of fevers, the hue is pallid, and the surface rugose, presenting the *goose-skin* appearance. As reaction supervenes, this disappears, and passes, with the increase of reaction, into the warm and carnation glow of health. When, however, no such healthy reaction occurs, as in adynamic, typhoid, putro-adynamic, and pestilential fevers, the pallid hue of the general surface passes into a lurid, harsh, or foul appearance; and this either becomes deeper and more remarkable, or, as in the choleric pes-

tilence, assumes a peculiar leaden or livid aspect as the malady approaches a fatal issue.

[The *green* colour is sometimes met with in the lungs, intestinal canal, and the muscles. In many cases it is impossible to discover the cause of the colour. The different tints of green probably belong, for the most part, to post-mortem changes. Some may depend, perhaps, on sulphuret of iron, which in a very finely divided state sometimes exhibits a blackish green colour; while most of them result from the effects of putrefaction, of which we are mainly ignorant. Many of them, doubtless, depend on the bile-pigment, which permeates the walls of the gall-bladder after death, and tinges the surrounding parts, and sometimes organs, at a considerable distance. This may be known from nitric acid changing the green first to blue, then to violet, and lastly to purple and pale red. Many abnormal colorations, it must be remembered, depend on matters which have been taken into the system in the shape of food, medicine, or drinks.—(See Hodgkin's "*Lectures on the Morbid Anatomy of the Serous and Mucous Membranes*," vol. i., p. 297–327.)]

17. *Deeper or other discolorations* of the skin are either partial—in spots or patches; or more marked in some situations than in others. These consist either of very limited exudations of the colouring particles of the blood under the cuticle, in one or other of the tissues composing the skin, or of exanthematous or other eruptions. The former constitute the characteristic of purpura, of scurvy, and of some forms of fever. When the vital cohesion or tone of the capillaries is relaxed in certain tissues, as in the vascular rete of the skin, and when, at the same time, the healthy crasis of the blood is much impaired, as in those maladies, minute exudations, containing more or less of the colouring matter of the blood, take place, in the form either of punctæ or of larger spots or even patches; and, according to the states of vital power and of the exuded fluid, present various hues, from a bright or scarlet red to a livid or blackish colour—*petechiæ*, *vibices*, *&c.* (See *art.* Fever, § 470, 471.) These seldom undergo farther changes unless in the extremities, where, from neglect or improper treatment, the exudations may be followed by ulceration, especially in scurvy, and by sphacelation, as in the putro-adynamic states of fever.

18. *B.* The *eruptions* on the surface of the body furnish most important indications as respects not merely the nature of the disease, but also its progress and issue. Exanthematous, acute, and chronic eruptions have been very fully discussed in the several articles on the diseases which are characterized by them. It is hence unnecessary to take farther notice of them, than to remark, in general terms, that the less general or copious the eruption, and the less the functions of the skin are impaired by it, the more may the result be considered favourable; and that the more diffused, general, and confluent the eruption, and the deeper the colour, the more unfavourable should be the opinion as to the issue. As respects all eruptions, but more particularly as regards the exanthematous, deepness of hue—lividity or darkness of colour—should be viewed as being much more dangerous than the amount or extent of eruption; for, even when extensive, the risk may not be materially increased as long as the hue is that of a lively red; but in proportion to the deepness of the tint, and as it approaches to lividity or blackness, the danger becomes extreme.

19. *C.* The *temperature of the surface* varies remarkably with the grades of vital power and of vascular action, and the character of the temperature is much modified by the state of the perspiratory function.—(*a*) A general *depression* of temperature often attends sinking of vital power; and when this sinking becomes extreme, it is commonly accompanied with cold perspirations, which are most remarkable in the extremities, as in the last or fatal period of most diseases, and over the whole surface in the choleric pestilence; the depression of temperature being also great, especially in this malady, and manifestly increased by the evaporation of the perspired fluid. Coldness of the surface ushers in many febrile and inflammatory diseases—especially the cold stage of periodic fevers and of visceral inflammations; but the coldness in these maladies exists more in the mind of the patient than to the perception of the physician; and it is generally attended by peculiar phenomena and sensations—by chilliness, horripilation, shivering, rigours, or horrors, which may be viewed as grades of the same sensation, and which are accompanied with a remarkable feeling of cold extending from the occiput along the spine, and with constriction and dryness of the integuments. In these cases, the sensation of coldness, when thus characterized—by horripilation or shivering—is altogether morbid, the temperature of the general surface either not being depressed, unless in the extremities, or being sometimes even much increased, especially over the trunk. The sensation of coldness and the shivering, both in these maladies and in cases of internal abscess, or where matter is being formed, are to be imputed chiefly to the concentration of the morbid action internally, or to the determination of the circulating fluids to internal or vital organs, and but partially to the diminished temperature of the extremities and surface, and to the constriction of the integuments; for, even when the sensation of coldness or chilliness is very considerable, and the horripilations amounting even to shivering, the heat of skin, especially over the trunk, may be excessive; but in these cases the surface is not only hot, but also dry and constricted; and either reaction is being about to be developed, or a copious perspiration is about to supervene, as when these symptoms indicate the formation of an internal abscess. When they occur in very aged persons, and depend neither upon the invasion of a febrile paroxysm, nor upon any visceral irritation or *inflammation*; and even when, in those persons, they recur at intervals, and alternate with sensations of heat or flushing, they are dangerous symptoms, generally issuing in dissolution.

20. (*b*) The coldness of the surface, whether actual, or existing chiefly in the sensations of the patient, whether marking the invasion of a febrile paroxysm, or the commencement of inflammatory action, or the formation of abscess in an inflamed organ or part, should be viewed chiefly as a change in the state of organic nervous power or influence upon the vascular system; this influence being more or less depressed or impaired in the extremities and periphery of the frame, and either determined to, or increased in vital or internal organs, the vascular system being similarly affected, owing to the organic

nervous influence on it. If this influence be so powerfully impressed as to be incapable of restoration, or so overwhelmed by the cause impressing it as to sink progressively, coldness of the surface becomes more general, more manifest and actual, and death ultimately takes place; but when the organic nervous or vital influence is morbidly impressed, without being overwhelmed or destroyed altogether, the concentration of that influence in vital organs, or the remains of it in these, enable them to react upon the blood which is superabundantly returned or determined to them, and thus the circulation is kept up, and secretion and excretion are promoted, until the morbid impression and its various consequences are removed. One of the earliest of these consequences is depression of the animal temperature, with constriction of the integuments, which is followed by reaction when the vital influence is not altogether overpowered. According to the nature of the morbid impression, or of the irritating cause, the temperature of the surface, and the sensations and other phenomena characterizing the state of the cutaneous surface, vary remarkably; and, while the temperature may be absolutely lowered, with or without a sense of chillness or coldness, or horripilations, in some cases, with shivering or rigours in others, and even with horrors and distressing tremours, it may not be materially depressed, unless in the extremities, these attendant phenomena occurring nevertheless. The rigours, and the still more severe manifestations of tremours or horrors, are indications of the severity of the morbid impression, or of the cause of irritation on the nervous system, and more especially upon the spinal cord and nerves proceeding from it. We often observe irritation of mucous or serous surfaces by various causes, as by the passage of a calculus along a duct, and even by the introduction of a catheter or bougie along the urethra, followed by constriction and coldness of the surface, by horripilations or rigours. In these cases the cause of irritation, acting upon a single part of the circle of organic nervous endowment and influence, disturbs the healthy distribution of the blood, depresses or diminishes the circulation in the periphery of the frame, concentrates it towards internal parts, while the irritation existing in a part of the organic nervous system is propagated by communicating nerves to the spinal cord, or to the roots of the spinal nerves, and is reflected thence by the spinal nerves to the muscles of voluntary motion, occasioning rigours, tremours, and horrors, which cannot be controlled by volition, until the more general diffusion of the primary morbid impression or irritation, and the reaction and the consequent equalization of the circulation remove the morbid effects extended to the spinal nerves and the muscles supplied by these nerves. (*See* § 22, *et seq.*)

21. Coldness of the surface of the body is attended by various modifications, as respects both the sensations of the patient and the perception of the physician, according to the cause which produces it, and to the function or state of the skin at the time. When the coldness proceeds from depression or irritation of organic nervous influence, in connexion with manifest disturbance of the circulation, then the surface is generally also dry and constricted, as in the invasion of diseases proceeding from causes which primarily simply depress or irritate; but when, with this change in the nervous system of organic life, there is also loss of vital tone or cohesion—when, owing to the excessive irritation or depression, or to the loss of vital cohesion, or to poisonous contamination, there are also relaxation of the integuments, and increased perspiration, then the coldness of the surface is not merely augmented, but it is characterized by a peculiar sense of rawness as well as of coldness—partly augmented by evaporation, and partly by impaired circulation. Colliquative perspirations which are not consequent upon heats or flushings, and the state of the surface in the last stages of low fevers, in the choleric pestilence, and after poisoning by numerous depressing, contaminating, and irritant poisons, furnish various modifications of this condition.

22. (*c*) *Increased temperature* of the surface is an important sign of disease, whether it occurs primarily, or consecutively of more or less depression; and, according to the character of the increased heat, so may not only the state of vascular action be partly inferred, but also the condition or amount of vital power and resistance. Heat of the skin is rarely so great when it occurs primarily as when it supervenes upon chills or rigours. In the former case, it is more moderate, generally subsides sooner; and, unless when it is caused by the infection of some animal poison, is more free from other morbid phenomena manifested in the general surface. When heat of skin follows rigours, the reaction of the vascular system, upon which it chiefly depends, influenced, however, by the organic nervous power, carries the temperature several degrees above the standard of health, and this high range is often increased or prolonged by the constriction and dryness of the skin, and by the morbid state of the blood itself—morbid in consequence of deficient action of the emunctories during the preceding depression, coldness, chills, and rigours; the augmented quantity of effete materials in the blood irritating the blood-vessels and vital organs, and morbidly exciting the nervous system of organic life. The result, as respects the surface and integuments, is not merely an increase of temperature, but also, and chiefly, owing to the dryness of the skin, and to the state of the circulation now mentioned, a peculiar sensation imparted to the hand of the observer, and characterized by a harshness, acridity or burning, and sometimes by a feeling of stinging or tingling to the patient himself.

23. When the circulating fluids are not greatly altered or contaminated, and the organic nervous influence not seriously depressed or perverted, the excitement of the vascular system, producing augmented heat of surface, gradually subsides, and with it this particular effect. As the excited vascular action abates so the skin relaxes, secretion and excretion, in the several emunctories, either returning or increasing, and with the return of the functions of the skin the temperature of the surface falls. A fit of ague furnishes an apt illustration of the states of the surface of the body in different febrile and other morbid conditions of the frame, and of the succession of these states, and of the influence of the antecedent, in producing the consequent condition.

24. A harsh, fiery, or burning heat of surface is always an unfavourable sign, especially in visceral inflammation; and if, at the same time, the patient complains of a sense of burning at the præcordia, or of internal heat, with anxiety, jactitation, or restlessness, the extremities becoming cool

or cold, or being covered by a cold perspiration, a fatal result, especially by gangrene, may be expected. Increased heat of head indicates frequently a disposition to apoplexy in the aged, to inflammation of the brain or its membranes in the young and middle-aged, and to convulsions or meningitis in children. A burning or acrid heat of surface in the hot stage of periodic, and of hectic fevers, augurs a malignant or dangerous form of the one, and a fatal termination of the other, especially when diarrhœa is also present, or when the heat of skin is followed by excessive colliquative perspiration. The temperature of the surface is always highest over a sthenically inflamed organ;* and, as respects the extremities, it differs more or less in different sides in hemiplegic or partial paralysis, as shown when treating of that malady.

25. iv. The Perspiratory Functions of the skin are variously affected by disease, and aid more or less in evincing the nature and the result of the malady. Interruption to, or entire suppression of, the perspiration, as shown by dryness of the skin in the earlier stages of fevers, and of inflammations, is of much importance as respects the states of the circulating fluid and of vascular action. This state of the surface may be attended by depression of temperature (§ 19, *et seq.*), as in the cold stage, or in the invasion of these diseases, or by increased temperature (§ 22, *et seq.*), as in the hot stage, or when vascular action is excited; but, however associated, or accompanied by each in succession, suppression of the perspiration is indicative of the invasion or commencement of fever or of inflammation, when attended by coldness of surface or by chills or rigours, and of a farther advanced state of these maladies when the skin is not only dry, but also hot. The amount of dryness, and of either coldness or heat with which dryness is associated, and the duration of these states of the surface, are matters of much importance, in our estimation, of the nature and extent of disease, and of the probable issue; for if the suppression of the excreting function of the skin be more or less complete, and of considerable duration, and no other excreting organ or emunctory supply vicariously the defective function—if the injurious elements and materials usually eliminated by the skin are not partially or altogether carried out of the blood by other organs, it must necessarily follow that the prolonged suppression of the perspiratory function will contaminate or poison the blood; and that the primary or local disease will be thereby exasperated, or a morbid state of general vascular action will be developed, varying with the changes produced on the blood by the other emunctories, and giving rise to farther alterations, both functional and organic.

26. *A.* A *perspirable* and *humid state* of the cutaneous surface, when attended by a soft, natural, slightly unctuous, and moderately warm condition of it, is always a very favourable sign, especially when it is general, and not limited to a single region or part; but when the perspiration is spontaneously excessive, and results not from unusual exertion or from medicine, &c., more or less disorder, sometimes of a very dangerous nature, is then present. The *quality* and *odour* of the perspiration require attention as well as the quantity; and the circumstances and occasions of excess ought also to be noted. It should not be overlooked, also, that the cutaneous perspiration is not always or altogether suppressed when it is no longer manifest to the senses; for an insensible perspiration generally exists, which may vary with the state of the patient, with the temperature of the skin, and with the dryness, humidity, and electrical states of the air. The perspiration which may be insensible in dry states of the air, may become sensible, or collect on the surface, in the form of sweat, when the air is moist and relaxing. During health the perspiration is more insensible than sensible, and, along with the exhalation of fluid from the surface, a secretion takes place from the follicular apparatus of the skin, which softens, and even partially lubricates the cuticle, especially in the negro race, and promotes both the insensible and sensible perspiration by disposing the surface to the transmission of its accustomed exhalation. The sensible and the chemical qualities of the perspiration vary considerably in different regions of the body, owing partly to the greater admixture of the secretion from the follicular or sebaceous apparatus. The difference is most manifest in respect of the perspiration from the axillæ and the groins, &c., the organic or solid constituents being most abundant in the sweat of these regions. But before any notice should be taken of morbid states of the perspiration, the healthy condition of this excretion ought to be mentioned.

27. *B. In health*, the perspiration, when too copious to be carried off in the atmosphere, without becoming sensible, or in the state of insensible vapour, is condensed in the form of fluid or *sweat*, 1000 parts of which consist of from 993 to 995½ of water (Anselmino, Berzelius, Simon, &c.). The remaining solid constituents consist, 1st. Of substances soluble in water—watery extract, phosphate of lime, and occasionally an alkaline sulphate. 2d. Substances insoluble in water—desquamated epithelium, and, after the removal of free lactic acid by alcohol, phosphate of lime, with a little peroxide of iron. 3d. Substances soluble in ether—traces of fat, sometimes including butyric acid. 4th. Substances soluble in alcohol—alcoholic extract, free lactic acid, and acetic acid, chloride of sodium, lactates and acetates of potash and soda, lactate and hydrochlorate of ammonia. In addition to carbonic acid, nitrogen is exhaled from the surface in constant but varying proportions, according to the nature of the diet and the amount of exercise. The functions of the skin may be divided into, 1st. The *Physical*—the exhalation of pure water and gas. 2d. The *Organic*—the product of animal excretion, or the secretion of cells. The cutaneous excretion is in antagonism with the pulmonary, with the urinary, and with the intestinal; an excess of either diminishes more or less the amount of it.

28. *C.* The *amount* of the insensible and sensible (sweat) perspiration has been variously estimated in health, but not with that approach to precision which would warrant a positive statement. It is very remarkably increased or diminished *in disease*, the diminution being more difficult of estimation than the increase. In the

* [In cholera, I have frequently found the temperature over the epigastric region as high as 106° Fahrenheit, while the temperature of the mouth was 90°, or even lower. The same fact is noticed by Dr. Paine, in his "Letters on Cholera Asphyxia" (p. 96). Perhaps this may constitute an exception to the remark of our author, as no one will contend that there is actual acute inflammation of the stomach in this disease.]

cold states of disease, the diminution may be very remarkable, or scarcely to be estimated, and in some cases, as in those characterized by sinking vitality, the perspiration may be excessive, as observed in pestilential cholera. In hot states of the surface, the temperature may prevent a more than natural transpiration from being condensed into a sensible fluid, the perspiration being excessive and yet being insensible. But whether sensible or insensible—whether diminished or increased, but more remarkably when increased, the perspiration is attended by very different kinds of *odour*, the odour often depending upon the chemical constitution and organic constituents or elements of the excretion, and being generally peculiar to each specific disease, although different observers have described the odours differently, or have assigned to them different resemblances.

29. The *increase of sweat* is very remarkable, not only in different maladies, but also in different periods of the same malady. Thus, while perspiration is diminished or almost suppressed in the cold and hot stages of ague, it is remarkably increased in the sweating stage. The same is observed in the paroxysms of hectic, in remittent fevers, and in continued fevers, but in prolonged stages, and even in inflammations. The most remarkable increase occurs in acute rheumatism, in the advanced stages of pulmonary consumption, in pestilential fevers, and in most maladies characterized by sanguineous contamination or poisoning, or infection of the fluids; and, in these especially, the *quality* and the *odour* of the perspiration are much altered.

30. *D.* The *quality* of the sweat is changed in most febrile diseases; but the change of quality, with reference to each, has not been satisfactorily shown.—*a.* The free *acids* may be much increased. Lactic acid, the ordinary free acid, is usually more abundant than in health, in cases of rheumatism and gout, and probably, also, uric and acetic acids. Dr. PROUT detected the last in hectic fever, and both it and lactic acid may be present in the puerperal states of fever and in erysipelas. ANSELMINO found free acetic acid in women during their confinement, and STARK, an increase of the lactic acid in scrofula, rickets, and in several cutaneous eruptions.

31. *b. Ammonia* does not appear to exist in the sweat in a free state, but chiefly in the state of lactate or hydrochlorate, although it may be found soon after the fluid is excreted, and during its retention in the armpits and groins. As to the actual presence of ammonia in the perspiration during disease, the statements of chemists and other observers are devoid of precision; for we still require to know whether or no the ammonia exists in a free state at the time, or even after the formation of the sweat, or whether it is evolved by the combination of the acid which neutralizes it with another base. ANSELMINO found a larger proportion of ammonia in the sweat after an attack of gout than in any other case. BEREND states that the sweat in putrid and typhoid fevers is ammoniacal. That it sooner becomes ammoniacal in these maladies than in any others, owing to a greater amount of animal matter contained in the perspiration, appears to be nearer to the truth. It may, however, be admitted, that all sweat of a putrid odour either contains free ammonia, or sooner becomes ammoniacal. According to NAUCHE, the sweat in nervous diseases soon becomes alkaline. On this, and other topics connected with the chemistry of the secretions and excretions, SIMON and others are loose in their statements and in their authorities.

32. *c.* The *salts* are often much increased. PROUT observed a great increase of the chloride of sodium. After attacks of gout, and in the gouty and rheumatic diathesis, the phosphates of lime, as well as the urates, are increased as respects either their proportions in the sweat or the absolute quantity excreted. In critical and in colliquative sweats, the proportion of the usual solid constituents differs remarkably, although the amount of difference is not ascertained; and there is every reason to infer that in these, and in exanthematous, low, putrid, and pestilential maladies, there is a considerable change, especially an increase in the fatty, extractive, and saline ingredients of the perspiration; and that, moreover, substances not usually found in the sweat may, in these diseases particularly, be detected in it. ANSELMINO and STARK say that *albumen* has been found in the perspiration in cases of rheumatism, and in gastric, putrid, and hectic fevers. *Fat* has been found in the perspiration in colliquative and low maladies by myself in several cases; *uric acid* and urate of soda have been detected in the sweat of arthritic persons, and cases of gravel; *bilin* and *biliphæin*, in the perspiration of persons who are jaundiced; and the red colouring matter of the urine, *uroerythrin*, in the perspiration in rare cases of fever. The colouring particles of the blood have been seen in the perspiration in scorbutic cases, and in putrid and pestilential maladies, in rare instances.

33. *d.* Various substances foreign to the economy have been detected in the perspiration after their ingestion. The chief of those are sulphur, mercury, iodine and iodides, asafœtida, garlic, saffron, indigo, prussian blue, turpentine, &c. These may be partially altered, or combined with other materials; and many other substances, even when digested, during their partial excretion by the perspiration, or by means of certain of their constituents, impart an odour to this excretion, by which even the nature of these substances may be recognized. Although these circumstances are of little importance as signs of disease, yet they should be held in recollection when the *odour* of the perspiration is estimated as a means of recognising certain maladies, and they ought to be viewed as furnishing proofs of the part which the skin performs as an excreting organ.

34. *E.* The *odour* of the sensible and insensible perspiration has not been sufficiently attended to in the recognition and diagnosis of disease. An experienced and closely observing physician will often at once perceive the nature of the malady, from the *odour* of the effluvium proceeding from the body of the patient, even before he may have seen it or approached it. This is especially manifested by exanthematous and pestilential fevers; and although many, whose sense of smell is not acute, are incapable of distinguishing disease by this sense, others are often at once thus enabled to recognise the nature and even the progress of the malady. Most of those specific diseases which are propagated by the effluvia proceeding from those already suffering from them by infection, impart a more or less peculiar, and generally an offensive odour; and although this odour and its resemblances may be familiar to the observer, yet he will rarely be able to describe it in terms which

will make it accurately known to another. The effluvium from persons in pestilential cholera is especially offensive and sickening, and it always imparts a sense of depression to those who perceive it. That from small-pox, or scarlet fever, or measles, differs from each other, or is peculiar to each. The odour of the sweat of persons in putroadynamic fever and scurvy is generally of a putrid character. That of rheumatic and gouty persons is usually acid. Females in puerperal fevers exhale a peculiar sweetish acid odour. Persons whose intestinal excreting functions are insufficiently performed—whose bowels are much confined, are often subject to a particularly offensive, as well as an increased perspiration. The determination of the odours of the perspiration in diseases is, however, quite subjective, and different observers generally describe them by different resemblances, which are not always assigned with accuracy. Thus the perspiration of persons with itch is said to have a mouldy odour; that of scrofula to resemble the smell of sour beer; that of syphilitic patients to have a sweet odour; and that of ague is said to smell like fresh-baked brown bread. The odour of the perspiration in disease, especially in respect of infection, has been imperfectly attended to, although deserving of attentive observation.

35. *F.* The *other sensible or physical qualities* of the perspiration consist chiefly in those which have been partly noticed when describing its chemical conditions. An acid or an alkaline state of the sweat may readily be ascertained by the usual test-papers; but the acid or alkali present is determined with much greater difficulty. The appearance of the linen generally shows the presence or absence of the colouring matter of the bile; and even common bibulous paper will often demonstrate the existence of fatty or oleaginous matters. A watery and copious sweat is commonly produced, in the previously healthy, by exertion, by increased temperature, and by diseases of simple vascular excitement, when the other emunctories are duly discharging their functions. In these circumstances, the perspiration is warm, copious, watery, and without morbid odour. In low, putroadynamic, colliquative, and pestilential maladies, the sweat may be abundant, thick, clammy, cold, and variously altered in chemical constitution, especially in the amount of animal extractive matters, in epithelium scales, in saline ingredients, in odour, and in the changes it evinces soon after being collected; but in all these particulars, farther and more accurate observations than we yet possess are required.

36. v. The Nutrition of the Body is one of the first circumstances which attracts the attention of the physician, the character as well as the amount of nutrition appearing to him of great importance. The diminution or abundance of adipose substance; the amount of emaciation or of obesity; the size and tone of the muscles; the rigidity, firmness, or flaccidity of the flesh; the colour and state of the integuments, and the presence or absence of intumescence, œdema, anasarca, or leucophlegmasia, are appearances which always interest the medical observer.—*A. Emaciation* is, when very remarkable or excessive, of great consequence in our estimation of the nature and ultimate issue of disease. In all cases when it is considerable, and especially when very great, it requires close consideration, in respect both of its causes and of its morbid relations.—*a.* Emaciation increases rapidly in low, continued, remittent, and hectic fevers, the degree of emaciation and the rapidity of its progress indicating the severity and danger of the malady. In organic diseases of the lungs, stomach, and digestive organs generally, emaciation is always present, the acceleration of its course, and the degree to which it has advanced, furnishing proofs of the danger to be expected, especially when it is attended by quickness of pulse and other febrile symptoms. In acute or febrile phthisis, the rapidity and the extreme degree of emaciation are among the most prominent and fatal indications furnished by the malady, and may be the most remarkable when cough and expectoration are the least observed. In all diseases which tend to inanition—in structural changes in the œsophagus, cardiac and pyloric orifices of the stomach, and in the mesenteric glands, emaciation advances more slowly, but to an equally great extent. In the more chronic states of phthisis, in diseases attended by augmented secretion or morbid discharges, emaciation is slower in its progress, but it also becomes extreme, if the malady receives no check, or is not removed by treatment. In continued fever emaciation seldom is apparent until the period of vascular excitement subsides, but after this period it advances rapidly—the more rapidly the greater the danger, more especially in the intestinal or gastric complications of fever. When with rapid or extreme emaciation there is also a dusky, lurid, or livid hue of the surface, the danger is very great; and if eschars, &c., form on parts which are pressed upon, it is still greater.

37. *b. Partial emaciation* is observed chiefly in paralyzed limbs or diseased parts, and depends upon the inaction of the muscles of these parts for a long period. In many cases the muscular emaciation is concealed by a degree of œdema or leucophlegmasia, which often affects the paralyzed limb. In all cases, therefore, it is of use to know to what extent the emaciation is that of the adipose tissue, or of the muscular structures. In the slighter forms the adipose tissue only is diminished, while the muscles are but little diminished, but in extreme cases the muscles also become extremely flabby, and ultimately wasted.

38. *c. Arrest of the progress* of emaciation, and a more or less marked restoration of the flesh, and especially if there also be a restoration of strength and of the natural hue of the surface, are among the most favourable indications of returning health, and of the removal of the pathological conditions upon which emaciation depended. *The superabundance* of adipose tissue is noticed in the articles Adipose Tissue and Obesity.

39. *B. Flaccidity* of the soft-solids of the body may precede or accompany emaciation, or even œdema, anasarca, &c. But, however attended, it is always an indication of debility or exhaustion, and often in connexion with impaired nutrition. In fevers especially, flaccidity of flesh is attended by discoloration of the surface (§ 16, 17), and, as they proceed, by alteration of the blood, especially as respects the hæmato-globuline and saline constituents, by anæmia, by absorption of the adipose substance and emaciation. During low fevers, and in the more inflammatory states of fever, after the stage of vascular excitement has abated, flaccidity of muscles, absorption and emaciation proceed rapidly. Nutrition is arrested from the commencement of the malady;

and, although the arrest is not manifest at an early stage, it has, nevertheless, taken place, the capillary turgescence arising from febrile or vascular excitement preventing it from being apparent.

40. Where flaccidity is most remarkable, emaciation not having advanced far, the flesh has often unnatural *softness*, especially in the leucophlegmatic temperament; and in some cases, the softness and flaccidity are either unattended by apparent emaciation, or characterized by turgescence, the unanimated or partially discoloured hue of the surface suggesting the idea of an unhealthy, watery, or semi-liquid state of the adipose and cellular parts below the integuments. This condition is intermediate between the natural and the œdematous or anasarcous state, and is aptly called *leucophlegmasia*. When partial, it often passes into œdema, intumescence being then very considerable, the surface *pitting* from pressure; and, when more general, it may pass into *anasarca*, the watery effusion into the cellular and adipose tissues being such as to produce great distention of the integuments, with pitting, &c. This *leucophlegmasia* is always an important sign of disease, and is often attended by anæmia, or rather by poorness of the blood—by a deficiency of hæmato-globulin. When this state is very marked, whether there be emaciation or intumescence, chronic disease of the digestive and assimilating organs may be inferred, and consequently impaired or morbid nutrition. Attention, in these cases, ought to be directed not only to these organs, but also to the functions of the kidneys and to the cardiac signs. In females, the uterine functions are generally more or less disordered when this sign of disease is present, and when there is also a yellowish or jaundiced tint of surface, organic change in the biliary apparatus may be inferred, which commonly terminates in ascites, or even in more general dropsy.

41. vi. The Organs of Voluntary Motion —*the locomotive organs*—are variously and seriously affected by disease, owing chiefly to the states of the nervous centres, by which the muscular apparatus is actuated, but, in many maladies, to the conditions also of organic nervous energy of the muscles themselves, and of the blood. Loss of motion or of sensibility, or of both, in a part, or in one half, or in the whole of the body, has been fully treated of under the head Paralysis. But the locomotive organs may be more or less paralyzed, or similarly affected, in maladies which have not been usually termed paralytic.—*A*. In adynamic, putro-adynamic, typhoid, typhus, and exanthematous fevers, the loss of muscular power is very marked, even from the commencement; and in these maladies it is not to be so much imputed to the state of the brain, spinal cord, and their envelopes, as to that of the organic nervous system, the muscles themselves, and ultimately the blood, being influenced by this system. So remarkably are the locomotive organs affected in these, and in all low or malignant fevers, as to render them incapable of retaining the standing or sitting position, or even a position on either side, the patient being constantly supine. The degree in which voluntary muscular power is prostrated is remarkably great in all these fevers, the amount of danger being partly manifested by the degree of prostration, and the inability to lie on or turn to either side. Among the most favourable and earliest signs of recovery, is the return of the power to lie upon either side, and afterward the capability of turning from the one to the other. (§ 4, 5, 6.)

42. *B*. But muscular power is not only *lost* or *prostrated*, in the modes evinced by palsy and low fevers, but is also otherwise affected, and in various ways. Owing to changes implicating the nervous centres of animal life, the muscles are frequently capable only of imperfect, uncertain, intermediate, or irregular contractions, the motions of the limbs or members being similarly characterized. These morbid states of voluntary motion are apparent only upon efforts at locomotion, or on volition; but other morbid states of motion occur, and continue in opposition to volition, and consist, 1st. Of continued tremour; 2d. Of frequent or continued contraction and relaxation, with uncertain or imperfect voluntary motion, as in chorea; 3d. Of spasm or cramp, of short or momentary duration; 4th. Of spastic or permanent, or continued contraction of one or more muscles; 5th. Of more or less general spasm, followed by partial or more general relaxation or irregular action, as in epileptic and convulsive seizures; and, 6th. Of continued general spasm, as in tetanus. These states of locomotive function present numerous associations and relations, which serve both to characterize specific forms of disease, and to indicate the issue of the disease in which they are observed.

43. *a*. The *prostration* of muscular power observed in low fevers is always attended by flaccidity of the muscles, indicating impaired rigidity and tone of the muscular fibres, and loss of irritability; and by a harsh, discoloured, or lurid hue of the surface, evincing a morbid state of the blood, and of the functions of the capillaries. These states show the propriety of having recourse to such agents as will most efficiently promote or rouse organic nervous energy, restore the excreting or depurating functions, and counteract the morbid or contaminating changes taking place in the blood. Unless the conservative influence of life be supported by these measures—unless vital resistance to contaminating or hurtful influences be thus promoted, prostration of muscular power, and sinking of vital function, proceed with increased celerity, and soon terminate in dissolution; a favourable crisis taking place on some occasions only, by means of vital resistance, and the spontaneous action of an important emunctory thereby developed under the favourable circumstances of locality, of constitution, and age.

44. *b*. The *imperfect and indeterminate contractions* which follow volition are generally occasioned by exhausting discharges, by masturbation, or premature or excessive sexual indulgences, and are followed by general palsy, and often also by imbecility. The general palsy of the insane is of this nature, and, although life may be protracted for years, it is generally shortened in the manner shown in the articles on Insanity (§ 170) and Palsy (§ 65, *et seq.*). In these cases the cerebro-spinal centres are often more or less wasted or altered in their intimate organization, and frequently little or no aid is derived from medical treatment, or even from diet or regimen.

45. *c*. *Continued tremours*, or constant shaking of a part—of the head, of an extremity or limb, &c.—or frequent twitchings of a muscular part, are commonly indications of irritation at the origins of the nerves supplying the affected parts,

or of some changes disturbing these nerves. When this sign consists of either shaking or tremour, it may continue for many years, the patient often reaching the usual duration of human existence; but it is rarely or never controlled by medical treatment, although life may be prolonged by a regular and abstemious regimen and diet. The *twitchings* which sometimes affect one or more muscles, especially the muscles of the face, are generally much more serious signs, and although they may continue for years, yet they generally terminate sooner or later in apoplexy or palsy.

46. *d. Cramps* or *spasms* may depend upon irritation of the bowels by acidity or flatulence, and, when they affect the lower extremities in the gouty diathesis, they generally proceed from this source, and are often connected with the presence of morbid or effete matters in the circulation. More *permanent or protracted spasms* generally proceed from inflammatory action in those portions of the nervous centres where the nerves originate that supply the contracted muscles; and these are often the forerunners of palsy, are sometimes associated with palsy of adjoining parts, or of opposite limbs, and are often followed by apoplexy or coma.

47. Cramps or spasms, varying in character with existing pathological conditions, occur in various diseases. They often affect the muscles of the lower extremities when the intestinal canal is violently irritated, and often also the abdominal muscles. Although indicating a severe state of disease, they are seldom attended by danger, unless they extend to the superior extremities, or are symptomatic of pestilential cholera, or of the ingestion of acrid, or of irritant and depressing poisons (see *art.* Poisons, *plurics*). When they occur in the course of phrenitis, of apoplexy, or of palsy, they are unfavourable symptoms, and indicate at least a severe form of disease, passing into organic changes in parts of the nervous centres. They are also most serious indications when they occur in fevers and in puerperal females. The same remarks apply to *convulsions* appearing in the circumstances now mentioned, unless they are symptomatic of hysteria. (See *arts.* Convulsions, Epilepsy, Hysteria, &c.)

48. Muscles are sometimes singly affected, or the affection extends merely to such muscles as are supplied by a single or by a pair of nerves; and the affection may be either that of *paralysis*, or of *spasm*, or the latter followed by the former. These partial or limited affections are often important indications of the early stages of structural changes in those parts of the nervous centres connected with the origins of the nerves supplying the affected muscles. When one or more of the muscles of the face are thus affected, unless a manifest cause exists in the course of the nerves supplying them, then more serious results may be expected, in the form either of apoplexy, or of convulsive coma, or of more complete or general palsy. If the muscles of the tongue or of the pharynx be implicated, in either of the modes just stated, structural changes at the origins, or in the course of their nerves, may be inferred, which will sooner or later terminate in an apoplectic seizure, or in hemiplegia. When these muscles are so affected as to prevent articulation, or deglutition, or both, an apoplectic attack, rapidly terminating in death, generally ensues after no very long interval. Prolonged spasm or contraction of the hands or feet, or of both, is observed in infants and children, in connexion with cerebral disease, and often also with laryngismus: it is always a very dangerous symptom.

49. Muscular movements are affected by disease in every form or grade from complete loss of the power of contraction to impaired, weak, or irregular, or uncertain contraction, involuntary twitchings, clonic or atonic spasms, or convulsive movements, spastic or protracted contractions, and tonic or tetanic contractions of a prolonged and general kind. These grades of diseased muscular action are not progressive; they are seldom consecutive or progressive, but one or other generally appears independently of the rest, and, if one state or form supervenes on the other, that of spasm is most frequently followed by paralysis, this latter being rarely followed by spasm. These several and very different forms of muscular affection are common in infants, in children, and are not infrequent in adults and aged persons. In young subjects, especially in children, they are more frequently sympathetic of irritation of the digestive canal, of teething, of intestinal worms, although sometimes proceeding more directly from alterations in the nervous centres or their envelopes; while in adults and aged persons they more frequently arise from these latter morbid conditions. But whatever changes of a structural nature may induce them, they may severally appear in different or even in opposite states of the vascular system—in states of anæmia or deficiency of blood, or of natural fulness, or of excessive plethora; and these different conditions of the vascular system are not especially allied to particular forms of disordered muscular action, for, with vascular anæmia, loss of motion, or impaired or uncertain motion, or clonic spasm, or convulsions, or even protracted spasm, may take place, although clonic or atonic spasm or convulsion is the most common. The same remark applies to other states of the vascular system, for, even when loss of motion may be most complete, vascular fulness may be greatest, and even when spasms are most general and protracted, as in tetanus, and in its several modifications, the vascular system may be equally exempt from deficiency and fulness of blood. All disorders of the muscular movements require close observation and most particular investigations into the pathological states producing them. They are of the most serious import, especially in adult and aged subjects, unless when symptomatic of hysteria or gout, and even then they ought not to be undervalued; and, unless they are referred to inflammatory action in some part of the nervous centres or thin envelopes, they are seldom benefited by large vascular depletions; or, if depletions be indicated, they ought to be employed with caution, those which are local or derivative being the most serviceable. Much more frequently very opposite means to vascular depletions are required, especially tonics, antispasmodics, stimulants, &c., variously conjoined with other means, according to the changes inferred in each form of these disorders, and in each case which comes under treatment.

50. *C.* The *joints* and *ligaments* furnish signs which are intimately connected with constitutional diathesis, and with disorders of the digestive and vital organs. In the gouty and rheumatic diathesis, they are not only the most frequent seats of disease, but also the parts to which at-

tention should be directed in forming an opinion as to the recurrence of disorder or the means of averting it. A tumid condition of the joints, and relaxation of their ligaments, whether appearing singly or in conjunction, are certain indications of predisposition to disease, even when little disorder besides is manifest. The former of these, especially when associated with a marked development of the lymphatic system, or with enlargement of the glands, or fairness of skin, &c., is a certain sign of the scrofulous diathesis; while the latter is connected with constitutional debility, and is very frequently the consequence of masturbation. Primary debility and consecutive exhaustion, in these manifold conditions, are always attended by a weak or unusually flexed state of the joints; and, whether appearing in childhood or in later periods of life, the joints and ligaments most prominently betray these conditions. The more vigorously the joints and ligaments perform their offices, the more perfectly are the several vital functions performed. When the joints swell, or are puffed, in the advanced course of the severer cases of small-pox or of scarlet fever; or at an advanced stage of puerperal phlebitis, or even in other forms of phlebitis, or in erysipelas, secondary inflammation and consecutive suppuration in these parts may be considered to have either commenced or somewhat advanced. There are no external parts which more certainly evince depression of organic nervous or vital power, or more frequently experience the injurious effects of infection or contamination of the blood—whether animal or external infection, or self-contamination by suppressed excretion or morbid absorption—than the joints, as I have shown and explained when treating of the Sympathetic Associations of Disease (§ 21, 72).

51. Not only the large, but also the small joints are objects of attention in disease. The latter are often the seats of painful affections, especially in females after the menstrual epoch of life, or during far advanced age, these affections partaking more or less of a rheumatic or of a gouty character, or of both. They are generally dependent upon disorder of the digestive and biliary organs, and impairment of the excreting functions of the skin and kidneys. The last joints of the fingers are often enlarged in phthisis, while their ultimate extremities are wasted, and the nails are uncated or bent over the wasted tips of the fingers. In most diseases of debility or exhaustion, and in febrile maladies, the motions of the joints, and especially the remarkably impaired power of sustaining the weight of parts superimposed when the limbs are extended in attempting to stand erect, evince the degree of vital depression, and the loss of muscular and nervous energy.

52. The extremities also beyond the larger *joints* become the seats of *emaciation*, or of *œdema*—of the *former* in protracted chronic diseases and in those just named, of the *latter* especially when the limbs are depending, or when the venous or lymphatic circulation is interrupted by pressure, or by vital exhaustion or other causes. When œdema or swelling of one or more extremities occurs from the pressure of internal tumours, or appears in the last stage of phthisis, it is an unfavourable sign; in the latter disease especially, it generally ushers in a fatal issue. It is a very prominent sign of inflammation of the lymphatics, or of the veins, or of both; and it sometimes occurs in artereitis. In phlegmasia alba dolens, the swelling is very great, with little or no pitting by pressure, the veins and lymphatics being generally obstructed, and the adipose and cellular tissues loaded with a semi-coagulated lymph. Œdematous swellings of the extremities are always unfavourable signs when they appear in the course of prolonged internal maladies, especially upon diseases of the heart, kidneys, lungs, liver, or spleen; or upon ovarian disease, or aneurism, or internal abscess, or tumour. If œdema affect one arm, it is generally unfavourable, although no disease of the heart, lungs, or pleura can be detected. Swelling of the arm is a very important sign of tumours, especially cancerous diseases of the mamma, as showing that the lymphatics, or even the veins, have become affected. Œdema of the lower extremities, when owing chiefly to debility, or to a depending position, or to both, or to the pressure of the gravid uterus, or of fæcal accumulations in the cæcum or sigmoid flexure of the colon, generally disappears after the removal of the cause.

53. The *nails* of the fingers and toes, and the *hair* are often affected by internal as well as external maladies. The *nails* frequently manifest cachectic states of the system. They become elongated and uncated, or bent over the wasted tips of the fingers in phthisis; often also blue in this malady and in other diseases of the lungs and air-passages, when the blood is not sufficiently changed by respiration, and in congestion of the heart or lungs. They, with the fingers, assume a still more livid hue towards the fatal termination of these diseases, and during the collapse of pestilential cholera. The nails and matrix, or secreting structure of the nails, are altered, the former becoming thick, or brittle, dry, &c., in several chronic cutaneous affections, especially in psoriasis lepra, pityriasis, &c., evincing an obstinate form of those affections. The nails partake, to some extent, of the alterations of the cuticle, in acute and chronic diseases attended by exfoliation of this tissue; the hair also becoming implicated.

54. In acute or febrile phthisis, in exanthematous and in continued fevers, the *hair* falls out, becomes thin, dry, weak, and straight. This affection of the hair is not very marked in chronic phthisis, and it does not occur until the most advanced stages of, or in the course of, convalescence from these fevers. The hair falls out more slowly in consequence of the syphilitic and mercurial poisons, of masturbation, of premature or excessive sexual indulgences, of mental exertion, and the depressing passions. It becomes prematurely *gray* from pityriasis, from sudden mental shocks, from the depressing emotions, from excesses of all kinds. Loss of the hair, premature grayness, and exuberance of the hair, are severally more or less hereditary in families. The loss, grayness, or want of lustre of the hair, depends upon defective nutrition or atrophy of the follicular bulbs of the hair. (See *art.* Hair.)

55. II. Symptoms and Signs furnished by the Senses and Nervous System of Animal Life.—The *signs* furnished by *the organs of sense* are dependent on the states of the brain, although often more or less influenced by the organic nervous system. The intimate dependence of the senses upon the brain is evinced most remarkably by the *eyes*, and less so by the function

of *hearing*. The sense of *smell* is influenced by the respiratory functions and states of the brain and respiratory passages, while the brain is often affected through the medium of this sense. *Taste* is very closely connected with the digestive and organic functions. The sense of *touch*, while depending on the brain, requires the media of transmission to the brain to be capable of conveying the impression which touch produces. In all cases, it is necessary to *perception* through the medium of any of the senses; 1st, that an impression be made on the sense; 2d, that the nerves of sense should be in a state capable of transmitting the impression to the brain; and, 3d, that the brain should be able to perceive the impression which has thus been made. The impression made on the senses may fail in either of those quarters or channels.—(*a*) The impression may fail owing to the *organ* of sense not being in a state to receive it at all, or to receive it in a normal manner—as the eye or ear from disorder or disease; or the organs of smell and of taste from diseases of the respiratory and digestive organs, with which they are connected.—(*b*) It may not be perceived, from the circumstance of the nerves of sense not being capable of transmitting the impression to the brain, as in cases of atrophy, injury, wounds, &c., of these nerves, or of tumours, morbid deposits, &c., pressing upon them; and (*c*) the impression may not be perceived, although received and transmitted, owing to the condition of the brain at the origins of these nerves in the brain, or at the seat of conscious sensation.—(*d*) While these are the requisites for the discharge of the functions of sense, diseases of other organs influence these functions in one or other of these three quarters—by implicating or disordering either the organ of sense, or the nerves communicating with the brain, or the brain itself.

56. Disorders of the functions of sense are of importance according to the sources to which they may be traced. They are most serious or dangerous when they can be referred to the brain; much less so when they proceed from the nerves of sense or from the states of the organs of sense, and least so when they are sympathetic, or depend upon the digestive functions. Owing to diseases of one or more of these quarters or sources, the functions of sense may be suspended, destroyed, diminished, depraved, or exalted; these several conditions depending upon any one of these sources, or upon two or more of them. They may be abolished or suspended in fevers, apoplexy, palsy, &c.; they may be depraved or altered in nervous fevers, and in diseases of the respiratory and digestive organs; they may be diminished or impaired in these and many other maladies, and they may be exalted early in fevers, in inflammations of the brain, spinal cord, or their membranes, and even in hysteria and hypochondriasis. It is so far favourable when the senses continue unaffected in acute diseases; and a return of their functions after a crisis in these diseases, or in conjunction with other early favourable symptoms, is a fortunate concurrence.

57. i. The Signs presented by the Eye are among the most important which are furnished by the senses. The volume, the position, the motions, the colour, the brightness and expression, the states of the several tissues, and the functions of the eyes demand a particular notice. The pathological changes of the organ are described in the article Eye; the sympathetic and symptomatic indications furnished by it are now only to be considered.—(*a*) The *size* of the eye is changed chiefly in hyperæmia of the tissues of the organ, in congestions of the brain or of the heart or lungs, by impending suffocation; in apoplexy, in phrenitis, in the paroxysms of epilepsy and convulsion, in delirium tremens, &c.; but the increased size is not great, the apparent increase being caused more by the prominence given to the organ by congestion or turgescence of parts posterior to it, than by the distention of its tissues. In these cases, the volume and prominence of the globe are rapidly or acutely increased; but they may be augmented in a much slower and more remarkable manner in several chronic structural changes of the organ. (See *art.* Eye, *pluries.*)

58. (*b*) The eye may be *protruded* slightly by turgidity of the tissues behind it, giving it also an apparent increase of size; and more remarkably by tumours, by aneurisms, by exostosis or osteosarcoma, by disease of the periosteum or of the lachrymal gland, by structural changes of the membranes, bones, &c., and by inflammation of the adipose tissue behind the eye. The position of the organ may be variously altered by these maladies. The eye may be directly protruded, or it may be forced or turned to one side.—*Sinking* of the eye (§ 8) is caused by absorption of the adipose substance behind the globe, by diminished turgescence of the vessels, and partially by an atrophy or lessened fulness of the tissues and humours of the organ. Sinking of the eyes is generally equal as to both, as it depends upon constitutional causes, and, when very remarkable, it is always a sign of a severe or dangerous malady. Where only one eye is sunk, a local affection of the brain, or atrophy of the nerves of the eye, or paralysis of these nerves, may be inferred.

59. (*c*) The *motions* of the eye may be affected by paralysis, or spasm, or by debility, exhaustion, &c. Immobility and wrong direction of the globe may arise either from paralysis or spasm, and are signs of disease of the brain or of its membranes, especially congestion, effusion of fluid, hæmorrhage, softening, or any of the alterations productive of apoplexy, palsy, coma, convulsions, &c. Immobility is observed chiefly in catalepsy, apoplexy, and profound coma, and indicates a severe or very dangerous state of the latter. A faulty direction of the eyeball, when permanent, depends chiefly on paralysis of the muscles on the side opposite to that to which the eye is turned, and more rarely to contraction of the muscles of that side. Squinting is a sign of organic alteration of the membranes or substance of the brain; is most frequently seen in hydrocephalus, in convulsions, apoplexy, cerebral inflammations, palsies, and is a most unfavourable or fatal sign of these maladies, the exceptions to this issue being few. During crises, or when it is observed in cases of worms, or in the paroxysm of epilepsy or hysteria, it is not so dangerous as in the foregoing maladies. Congenital or acquired squinting—acquired from habit—has no semeiological import.

60. Distortions of the eyes, of a passing or temporary kind, are produced chiefly by spasms of the ocular muscles, and occur chiefly in convulsive affections, in the diseases just mentioned, and in several acute maladies. When they are observed on the invasion of acute diseases, espe-

cially in any of the exanthemata, as small-pox, a most severe or dangerous attack is then indicated. If they appear in an advanced stage of cerebral diseases, of exanthematous or continued fevers, or in low or putro-adynamic fevers, the prognosis is still more unfavourable, or even fatal.

61. (*d*) The *colour* of the conjunctiva should not be overlooked: redness of this coat is, a sign of congestion or inflammation, either of it, or of congestion or inflammation of the brain or its membranes. The redness is most frequently the result of irritation from mechanical causes, or of catarrhal inflammation. When it is produced by acute sthenic inflammation, then the conjunctiva is also much swollen. In the asthenic states of conjunctivitis and in scurvy, the colour is a dark red. In apoplexy, in cerebral fevers, and in typhus, the conjunctiva is generally more or less congested and red; and frequently also in cases of vascular determination to the brain, especially in the morning before leaving bed. *Ecchymoses* of the conjunctiva are sometimes also observed in these maladies, and after epileptic or other convulsive attacks, these changes of this coat indicating a severe or dangerous disease. If the injection or congestion of the conjunctiva present a dirty brownish or livid hue, not only cerebral congestion, but also alteration of the blood may be inferred, and a most unfavourable or fatal prognosis may be formed, especially in putro-adynamic fever, typhus, small-pox, scarlet fever, and measles. Other changes in the eye connected with simple, gouty, or rheumatic inflammation, and the several alterations of structure of this organ, are described in the article EYE.

62. (*e*) The *form and size of the pupil* are much affected in cerebral diseases, and in other maladies, through the medium of the sympathetic nervous system. A *contracted* pupil is observed in active vascular determination to the brain, inflammation of this organ or of its membranes, in the early stage of irritation or scrofulous disease of the brain, before passing into effusion, in retinitis, and in poisoning by opium. When it occurs in apoplexy, or when one pupil is contracted while the other is dilated, either in apoplexy, palsy, or epilepsy, an unfavourable prognosis may be formed. A *dilated* pupil occurs in an advanced stage of hydrocephalus, in coma, and in all diseases of the brain attended by effusion or pressure, as apoplexy, the last stages of phrenitis, and meningitis. It may occur also after epilepsy, convulsions, and hysterical fits; and it may be produced by some narcotic POISONS. Its connexion with amaurosis and cataract should also be recollected. Dilatation of the pupil is observed in cases of intestinal worms, and often in scrofula, the early stage of phthisis, and in several chronic abdominal affections, especially in children. When it follows rapidly on a contracted pupil during cerebral affections, effusion or organic alterations may be inferred, the latter especially if any difference in the state of both pupils be remarked.

63. The *motions* of the *iris* should always be noticed in connexion with the size of the pupil. The iris may be unaffected by light, owing either to spasm or paralysis; this want of motion being most frequently remarked in the cerebral maladies already mentioned, and in typhoid and low fevers. In these, as well as in other maladies of a severe or dangerous nature, this is a most unfavourable sign. Increased sensibility of the iris, with quick dilatation or contraction, is observed chiefly in hysterical and irritable or sensitive states of the frame, and in the early periods of exanthematous or other fevers. It is also remarkable in diseases of debility, or in cases of vital depression, when the functions of the brain are unimpaired.

64. (*f*) The *lustre* of the eye depends chiefly on the state of the brain. It is increased in active determination of blood to, and in inflammations of, the brain or its membranes, until effusion, exhaustion, or coma supervene. Increased lustre is sometimes observed in apoplexy; it precedes and accompanies the delirium of fevers; and attends several states of insanity. The lustre of the eye is impaired on the invasion of most infectious maladies, in congestive affections of the heart, lungs, or brain, and in severe diseases of the abdominal organs. The lack of lustre is farther increased in the last stages of acute diseases, especially when the blood is contaminated, as in malignant or pestilential maladies, and is always a very unfavourable sign. It is often a fatal indication in inflammations of abdominal organs, and in these it evinces the occurrence of gangrene or fatal sinking. A glazed appearance of the eyes generally precedes dissolution.

65. (*g*) The *expression* or *look* of the eye, or the impression made by the eyes of the patient on the observer, is generally either that which is natural or usual, or that of anxiety, of terror, fright, or despair, or of wildness or madness. The expression of the eye generally harmonizes with that of the countenance. The *natural look* of a patient's eye is always a favourable circumstance in both acute and chronic diseases. A *timid* or *mild expression* is observed on the invasion of acute diseases, and before vascular reaction is developed, and towards the termination of dangerous chronic maladies. It is also seen in hysteria, in disorders caused by self-pollution, and hypochondriasis. A *timid, furtive, downcast*, or *unsteady* look is common in the disorders of the mind. An *anxious expression* is observed in diseases of the heart and of the respiratory passages, when the respiratory efforts are difficult, and in inflammations of the stomach, bowels, or liver. A look of *fright* or *despair* occurs in alarming cases of hæmorrhage, in violent colic or ileus, in strangulation of the bowels, in pestilential cholera, sometimes in acute inflammations of the digestive canal, and in accidental poisoning. It is always an unfavourable, and frequently a fatal sign. A *wild, terrified*, or maddened expression characterizes the paroxysm of rabidity, the accession of delirium and mania, delirium tremens, and phrenitis or meningitis.

66. (*h*) The *function of vision* is variously affected in disease, either with or without *increased* or *diminished sensibility of the eye* to light. *Increased sensibility* to light (*Photophobia*) is observed in many diseases: 1st, in diseases of the eye, especially in inflammations of the internal tissues, and in scrofulous, gouty, and rheumatic affections of the organ; 2d, in diseases in which affections of the eye become prominent phenomena, as small-pox, measles, catarrhs, &c.; 3d, in affections of the brain or of its membranes, especially in inflammations or irritations of, and vascular determination to, this organ, whether primary or associated with febrile or other maladies. Photophobia is generally observed during the early stages and progress of these, and before effusion or other organic changes consequent

upon inflammatory action or irritation have supervened. It also occurs in delirium, in mania, and several states of insanity; and, 4th, in various diseases, in which the nervous systems generally, both organic and animal, evince increased susceptibility and sensibility, as hysteria, hypochondriasis, rabies, and during recovery from many acute maladies. *Impaired sensibility* of the eye to light often occurs in far advanced stages of the diseases, in the earlier periods of which increased sensibility is observed. The *sensibility* of the eye to light, whether increased or diminished, should not be confounded with increase or loss of the power of vision; for vision may be very remarkably impaired when the sensibility to light is most acute, and the reverse is as frequently observed.

67. (*i*) *Diminution or loss of vision* may arise from a variety of pathological states: 1st, from changes in the tissues and humours of the eye itself; 2d, from disease of the brain, of its membranes, or of the optic nerves, or of changes implicating either these nerves or the ophthalmic branches of the fifth pair of nerves; and, 3d, from sympathy with disease of any of the abdominal organs: from intestinal worms; from hysterical, hypochondriacal, and of the nervous affections; from faintings, and from general or local debility or exhaustion (see *arts.* Eye and Amaurosis). When loss, or even diminution of sight occurs during delirium, or in the course of fevers, and in affections of the brain, the supervention of coma, or of apoplexy or palsy, or of both, may be expected.

68. (*k*) *Morbid* or *altered vision* presents various forms and phases. *Near* or *far sight* depends on the different degrees of convexity of the cornea, and on the states of the anterior humours or parts of the eyeball. Near sight (*Myopia*) is often congenital, and continues through life, or nearly so. It may, however, be acquired from the constant or frequent use of the eyes at near objects, or at the same near focus. Far sight (*Presbyopia*) may occur from habitually directing the eyes to distant objects, and is common in sailors. It is still more common in advanced age. It is owing chiefly to diminished convexity of the cornea. *Interrupted* and *half vision* occurs either from a partial paralysis of the retina, which is sometimes temporary and sympathetic, or from a more permanent change in the humours or nerves of the eye. It is generally symptomatic of disorder of the digestive functions when it is not continued; but when it is constant or increases, it is caused by a change in the optic nerve, or optic thalamus.

69. *Double vision* generally proceeds from disease of the brain or membranes, from effusion of fluid within the cranium, or from alterations implicating the medulla oblongata or base of the brain. It is an unfavourable sign whenever cerebral disease is indicated, especially phrenitis, apoplexy, palsy, epilepsy, &c. It may usher in a dangerous attack of apoplexy or palsy, or precede amaurosis, or it may follow the severer paroxysms of epilepsy or convulsions. It sometimes occurs on metastasis of rheumatism or gout to the brain; and it occasionally supervenes upon, or attends disease, especially inflammation of the spinal cord or its membranes, and it is then a most dangerous sign, inasmuch as it evinces the extension of disease to the base of the brain. Double vision may accompany intoxication, intestinal worms, and disorders of the digestive organs, fæcal accumulations, hysteria, &c.; but it is then associated with symptoms which indicate its nature, and is commonly temporary or soon removed.

70. *Vision* may be deformed — objects being seen in inverted, crooked, disfigured, or distorted forms. This state of vision occurs chiefly in cases of chronic organic diseases of the brain, membranes, or bones of the cranium. Objects may also appear brighter or darker than they really are, or different colours, or certain colours may not be distinguished. A *brighter* or redder appearance of objects than natural sometimes accompanies irritation or inflammation of the brain or its membranes. A *dim* or *dark* state of vision may proceed from debility of the retina, or from slight turbidity of the humours, or congestion of the posterior structures of the eyes. An inability to distinguish colours, or to perceive certain colours, indicate congestion, or alteration of the intimate structure of the retina. *Scintillations*, sparks, lights, or little fiery balls (*Photopsia*), occur in congestions, hyperæmia, and inflammation of the brain or membranes, and they sometimes precede epistaxis, apoplexy, palsy, amaurosis, epilepsy, &c.; but they may also proceed from irritation of the retina and optic nerve, and from congestion or inflammation of the more internal tissues of the eye.

71. *Dark points*, figures or nets, or reticulated spots (*Muscæ volitantes*), before the eyes, sometimes proceed from congestion, irritation, or inflammation of the retina and adjoining parts, but more frequently from slight capillary congestion of the interior structures, especially the capsules of the humours, or turbidity of the humours, or varicose states of the extreme or lymphatic vessels. These appearances, as well as others of a similar kind, may sometimes depend upon congestions within the cranium. The states of the organ from which they chiefly proceed are generally sympathetic of disorders of the digestive organs, and are often associated with chronic cutaneous eruptions. They are also symptomatic of intestinal worms, of hypochondriasis, and hysteria. They are most frequently experienced by persons who have strained or over-exerted their sight on small or near objects. These disorders of vision may be more or less manifest for many years—for thirty or forty years—according to my experience, without much disorder of the general health, when they are not made the subjects of local treatment by speciality doctors or surgeons, to whom, owing to the alarm of patients, they have often furnished rich harvests.

72. (*l*) *The seeing of objects which have no existence—illusions of sight*—are common in delirium, especially the delirium of fever, in states of fright or terror, in morbid states of the imagination, in delirium tremens, in states of intoxication, in the several states of acute or chronic insanity, in meningitis, and in rabies. It occurs chiefly from irritation or congestion of the cineritious portions of the brain, and is common in typhoid, low, continued, and exanthematous fevers, and in the last moments of sinking vitality, in acute and chronic maladies.

73. (*m*) The functions of the *lachrymal glands* are often disordered in disease. The secretion of tears is generally impeded in fevers, especially during the early stages, when all the secretions are scanty; the dryness of the conjunctiva in

these diseases, as well as in exanthematous fevers, favouring the occurrence of inflammation of this membrane. Increased secretion of tears may be either apparent only or real. It is often the former, when the caruncule lacrymales are red, swollen, or partially obstructed by inflammation, catarrh, &c. It is the latter in hysteria, hypochondriasis, in low and mentally depressed states of disease, in nervous fevers, and in the depressing mental emotions. An increased flow of tears is often most beneficial in severe mental shocks, and on occasions of mental distress; it is, however, frequently produced at pleasure, or in paroxysms of temper, by females.

74. ii. The Sense of Hearing furnishes signs, which have reference, 1st, to diseases of the organ itself; 2d, to diseases of the brain, with which this sense holds intimate relations; and, 3d, to diseases of more distant and less obviously related organs. The *first* of these have been treated of in the article Ear, and *diminution or loss of hearing*, from diseases of the *organ*, or of the *brain*, or of more *distant parts*, has been fully considered in the article Hearing. There remains, therefore, but little farther to say respecting the signs of disease furnished by this sense. *Noises* in the ears, and *earache*, are also severally symptoms of disease, either of the ear itself, or of parts in the vicinity, as of the throat or pharynx, or of distant parts, or of the system generally, especially continued fevers.—*a.* The *former* often precede the accession of delirium, and attend and aggravate delirium tremens. Noises in the ears also accompany anæmia, especially that consequent upon protracted rheumatism occurring in far advanced life; and they frequently attend diseases of the uterine organs, or large losses of blood either by hæmorrhage or by excessive blood-letting. In plethoric persons they sometimes usher in an attack of apoplexy, or of epistaxis, and they should be viewed as unfavourable signs. When they are experienced in very aged persons, especially in females who pass sedentary lives, without exercise in the open air, although not indicating danger, they resist all means of cure, if exercise in the open air be not regularly and perseveringly taken. (See *article* Ear, *Nervous affections of*.)

75. *b. Earache* is an unfavourable symptom in continued and exanthematous fevers, especially in scarlet fever and small-pox. In these, as well as in other constitutional maladies, and even in secondary syphilis, it indicates the supervention of a local inflammatory complication, generally extending from the throat along the Eustachian tube to the ear, and frequently either destroying the organ, or, after effecting this, extending to the membranes and substance of the brain, as I have shown to occur on many occasions, in connexion with these and other maladies (see *art.* Brain, § 146, *et seq.*). The importance of giving due attention to earache, and other affections of the ear, with reference to their pathological and semeiological relations, is more fully shown in the articles on Earache, and on *Inflammation of the* Ear.

76. iii. The Sense of Smell has intimate relations with the brain and respiratory functions. —*A. Acuteness of smell* (hyperosmia) is often present at the commencement of irritation or inflammation of the brain or its membranes, or of nervous, typhoid, and exanthematous fevers, and in hypochondriasis, hysteria, uterine affections, and often in epilepsy. It sometimes precedes the accession of mania or delirium.—*B. Want of smell* (anosmia) is occasioned by affections of the nasal membrane, in catarrhs, influenza, inflammations, &c.; and by chronic diseases of the brain, or of the membranes, or of the bones of the cranium; or by secondary syphilis, or by the progress of low or exanthematous fevers.—*C. Perversion* of this sense, or smells which are different from those perceived by other persons, or which are peculiar, or unusual, sometimes precede an attack of apoplexy or of epistaxis, or of paralysis. It sometimes attends disorders of the digestive organs, hypochondriasis, hysteria, uterine diseases, secondary syphilis, and organic diseases of the brain and cranial bones.

77. *D. The secretions* of the nose are affected in catarrh, influenza, in scrofulous affections, in continued and exanthematous fevers, in syphilis, in worms, and in various disorders of the respiratory and digestive organs.—*a. Itching* of the nostrils is a sign of the presence of intestinal worms, especially of the small thread-worm; and in females, of irritation of the sexual organs, often connected with masturbation. It occasionally precedes epistaxis, and in aged persons it sometimes is a prelude of dangerous cerebral disease. —*b. Hæmorrhage* from the nose (*epistaxis*) occurs under circumstances which have been fully described in the article Hæmorrhage (§ 65, *et seq.*). It is often a critical discharge in febrile, inflammatory, and congestive diseases, especially in congestions of the heart, lungs, or brain, and in active determinations of blood to the last-named organ. The occurrence of it may avert an attack of apoplexy or of palsy, when not injudiciously suppressed, especially at advanced periods of life. Passive epistaxis, the vessels being defective in tone, and the blood deficient in crasis, or poor, or contaminated, as often observed in cachectic habits, or in putro-adynamic states of fever, in scurvy, purpura, &c., is often attended by much risk, especially when these conditions of the blood and of vital power are prominently marked, and decided measures the most calculated to arrest the discharge are then required. (See *art.* Hæmorrhage, § 15, 16, 17, *et seq.*)

78. iv. The Sense of Taste is often affected in connexion with disorder of the sense of smell. It is either acute, impaired, lost, or vitiated in disease.—*a.* It is rarely more *acute* than natural. Acuteness of taste is most frequently observed in hysteria, hypochondriasis, in nervous affections, and occasionally in nervous fevers.—*b.* Taste is *impaired* or *lost* in catarrhs, catarrhal fevers, influenza, in acute or inflammatory indigestion, in chronic gastritis, or gastro-enteritis; in a loaded or saburral state of the digestive mucous surface. In congestive or inflammatory states of the brain, and in low, continued, and exanthematous fevers. When taste is restored early during convalescence from these maladies, a favourable issue may be expected; when it does not return during advanced convalescence from apoplexy or other diseases of the brain, or from gastric or cerebral fevers, a renewed attack or a relapse may be dreaded, especially if the sense of smell also does not return.

79. *c.* A *vitiated taste* is very common in all disorders of the digestive organs; frequently in nervous disorders, and often in affections of the respiratory passages —*d.* The taste may be *insipid* in catarrhal affections, in periodic fevers, in

mucous fevers, and in cases of intestinal worms. —*e*. It may be *bitter*, in bilious disorders, in bilious fevers, in jaundice, and in chronic and structural diseases of the liver, spleen, or pancreas, especially if it continue, notwithstanding the ingestion of wholesome food.—*f*. *An acid taste* is experienced during heartburn, indigestion, and disorders of the digestive organs generally. It is often caused by gout, or rheumatism, or calculous affections, by flatulence, or by eructations from the stomach.—*g*. A *salt*, or a *sweetish-salt taste*, is occasioned by the presence of small quantities of blood in the mouth, and by the expectoration of matters from the lungs containing either blood or purulent matter; and is thus present even in the early stages of pulmonary disease, especially phthisis.—*h*. A *putrid* or *foul state* occurs in gangrene of the lungs, and in syphilitic and scorbutic affections of the nose, gums, or throat. It is caused also by caries of the teeth or gums, by the expectoration of puriform matters, and by the discharge of abscesses by the mouth. It is an unfavourable sign in pulmonary, constitutional, and cachectic diseases, and in chronic maladies, especially where there is much debility or emaciation. It may occur in gangrene of any part of the digestive canal, and in adynamic dysentery, and then it should be viewed as a fatal indication. —*i*. A *metallic taste* is caused by the constitutional operation of mercury, and it often precedes the accession of salivation, or mercurial affection of the gums. It is also sometimes produced by other metallic poisons; and in rare instances it is experienced in agues and in chronic abdominal disorders. The states of the *tongue* are various, with or without the above alterations of taste, but they will be noticed in the sequel (§ 101, *et seq*.).

80. v. The Sense of Touch may be more or less altered, either in one limb or extremity, or in two or more.—(*a*) *Acuteness* of the sense of touch is observed in irritation or inflammation of the brain, spinal cord, or their membranes. It sometimes precedes mania, delirium, and apoplexy, and often attends hysteria, rheumatism, gout, and hypochondriasis.—(*b*) *Diminution* of the sense of touch, in various degrees, is observed in organic diseases of the brain, spinal cord, or their membranes, and especially when these changes are consequent upon inflammatory action, effusion or softening, or tumours. When loss of touch proceeds from these pathological states, the result is generally unfavourable. It may occur in hysteria, hypochondriasis, in chronic affections of the skin, epilepsy, delirium, syncope, &c., and then a less unfavourable opinion may be entertained. It may precede a crisis in fevers; but no dependence should be placed upon it as a sign in these cases.—(*c*) *Perversion* of this sense occurs in chronic changes in the brain, spinal cord, or their membranes, in nervous affections, and in misplaced gout affecting the brain or its membranes. In these cases of perversion, the sensation of some body intervening between the points of the fingers and the objects touched is generally experienced.

81. vi. The Signs furnished by Sensation or Sensibility depend, as those evinced by the senses, either upon the state of the affected part, upon the channels transmitting sensation, or upon the medulla oblongata and parts in the centre or base of the brain, which are more especially connected with the perception of sensation, or with conscious sensation. *Sensation*, whether *animal* or *organic*, is either exalted, impaired, or perverted, or suspended in disease. It may, moreover, be variously exalted and perverted in the same case, this conjoined alteration giving rise to a variety of feelings which have been recognised by distinctive appellations. These may severally proceed from the same pathological conditions as have been mentioned in connexion with alterations of the sense of touch.—*a*. *Exaltation* of sensibility is observed in irritation and inflammation of the spinal membranes, medulla oblongata and cord, in similar affections of the cineritious structure of the brain, in hysteria, hypochondriasis, rabies, &c.

82. *b*. *Diminished*, or *suspended*, or *lost sensation* occurs in apoplectic, convulsive, paralytic, epileptic, and cataleptic seizures, during syncope, and in all changes of the brain, medulla oblongata, spinal cord and membranes, occasioning temporary or more permanent loss of consciousness, or anæsthesia. It may accompany, in its less manifest states, continued fevers; and in its more extreme grades, it may follow delirium in the form of *sopor* or *coma*, in these and all other fevers. In all these maladies it is an unfavourable, and in many a most dangerous sign. Impaired or lost sensibility to the common wants of the economy, or to the usual and natural irritants or stimulants, or the loss of sensibility in parts not liable to the deprivation of it, is always a dangerous indication.

83. *c*. *Perverted sensibility*, or depraved sensation, is more generally associated with exaltation than with diminution of sensation. While exalted and impaired sensation should be referred chiefly to the cerebro-spinal nervous system—to *animal sensibility*, depraved sensation, as respects its chief manifestations, depends upon *organic sensibility*—upon the state of the organic or ganglial nervous system. Perverted sensations referrible chiefly to animal sensibility, are itching, formication, stinging, tingling, pricking, tickling, burning, &c. They are felt in the integuments and in the extremities—in the latter, during organic affections of the brain, spinal cord, and their membranes; and previously to, or upon recovery from, an attack of apoplexy, palsy, epilepsy, convulsions, gout, &c.—in the former, in exanthematous fevers, either previously to, or during the appearance of the eruption, and in numerous acute and chronic cutaneous diseases. Tickling or titillation, or a sensation intermediate between this and itching, is often experienced in the soles of the feet or palms of the hands, and sometimes in other places, without any disease being either present or expected. The former of these situations may, however, be artificially tickled so as to induce violent convulsions; and, if this cause be persisted in, the result may even be fatal. Spontaneous sensations of itching and tickling may also become so distressing as to occasion convulsions, delirium, or even mania, in hysterical and nervous persons, but this is very rarely observed. A sense of burning in the soles of the feet and palms of the hands is frequent in the gouty and rheumatic diathesis, in hectic, and in morbid states of the circulating fluids.

84. *B*. *Perverted sensations*, which are referrible chiefly to the organic nervous system—or *perverted organic sensibility*—vary very remarkably, from a sense of uneasiness and restlessness

to that of distress, anxiety, and acute pain.—(*a*) *Uneasiness* or *discomfort* occurs in the invasion of most acute maladies, and more especially of those produced by infection; but it also is observed after the suppression of any of the secretions and excretions, and on the appearance of any eruptive disorder. It also attends most chronic complaints, especially hysteria and hypochondriasis. *Restlessness* may be considered as a higher degree of discomfort, and is generally present in the circumstances just stated, or it follows uneasiness, during the accession of disease. A most distressing state of restlessness, or that attended by more or less anxiety, is observed at a far advanced stage of chronic and often also of acute diseases. Restlessness at the commencement or at an early period of acute disease is always an indication of a most severe or dangerous attack. If it appear in the course of febrile complaints, it is often occasioned by the accession of some important complication, especially in children, as inflammation of the brain, spinal cord or membranes, or carditis or pericarditis. It may, however, usher in a critical discharge; but if it continue, or appear after a crisis, in acute maladies, or at a far advanced period of either acute or chronic diseases in connexion with vital depression or exhaustion, or with frequent, or difficult, or anxious respiration, it is always a very unfavourable or fatal sign—usually fatal when it is referred to a state of internal feeling of distress or anxiety.

85. (*b*) Discomfort may proceed to restlessness, thence to distress, and thence to a feeling of *anxiety*, which is merely a more extreme sensation of distress. These grades of morbid organic sensibility vary somewhat in character and severity, according to the region or organ chiefly affected. The distress or anxiety attending asthma, pneumonia, effusion into the pleural cavities—*anxietas pulmonalis*—is different, and distinguished by the patient as different, from that which proceeds from disease of the heart, pericardium, and large vessels—*anxietas cardiaca*—and from that which is occasioned by acute disease of the stomach, liver, diaphragm, or by the ingestion of acrid poisons, or any of the more dangerous maladies of the abdominal viscera—*anxietas præcordialis*. Always keeping in recollection the differences between mental and bodily distress or anxiety, the latter should be referred especially to the morbid impression or suffering experienced by the organic nerves of the affected organ. This suffering may either exist in one of the organs just noticed, or be extended to several of them, or it may also implicate the nervous system of animal life, and occasion the *anxietas nervosa*, as in hysteria, hypochondriasis, rabies, tetanus, nervous fevers, &c. A feeling of *anxiety, distress*, or *suffering*, may accompany the cold stage of periodic fevers, or the invasion of malignant or pestilential maladies, or it may accompany the accession of a crisis. In these cases, although a most severe attack may be expected, inasmuch as this sign is an indication of the serious morbid impression made upon the organic nervous system, one of the prime factors of life, yet the danger is not so great as in those cases in which this feeling supervenes in a far advanced stage of the diseases above mentioned. When it thus occurs in this stage, when it follows closely upon acute inflammation, or when it is of long duration, the danger is very great, and even extreme in pestilential maladies—*anxietas moribundorum*.

86. (*c*) *A feeling of cold*, as already shown (§ 19), may exist independently of any depression, and sometimes even in connexion with an increase of the animal temperature. It may be attended by shiverings, shudderings, rigours, or even horrors, according to the grade or intensity of this feeling. The severity of this sensation is generally an indication of the severity of the consecutive attack when it ushers in an acute disease—either inflammatory or febrile; and it is no less an indication of danger when it occurs in the advanced course of inflammations, of eruptive fevers, and even of chronic visceral disease. Rigours are often the forerunners of dissolution when they occur in diseases in which debility or exhaustion is very remarkable (see above, § 20, *et seq.*). An internal feeling of cold, if experienced on the accession of disease, indicates a very severe and dangerous attack; if felt at a far advanced stage, it proceeds from fatal sinking.

87. (*d*) *An internal sensation of unusual heat* is frequent in acute or inflammatory diseases, and it may be present when the surface is actually cooler than natural. The feeling of heat may depend upon states of internal or central parts which do not reach the periphery even of the trunk; and it, as well as the feeling of cold, is to be referred chiefly to the changes in the organ or part in which the sensation is felt, the organic nervous system participating in these changes in an especial manner, inasmuch as it is instrumental in the performance of the calorific process. A sensation of heat, or even of burning heat, may be concentrated in internal or central parts, may accompany either open or latent inflammatory attacks, and may exist, especially in the latter, although the external surface or the extremities be cool or even cold. Local feelings of heat are indications of irritation and local vascular determinations of blood, or of inflammation, or of approaching hæmorrhages. A general feeling of heat attends the more sthenic forms of fever, both periodic and continued, especially in the stage of vascular excitement. A local sensation of heat is much more dangerous in these fevers than a general feeling of heat, and when it is experienced in these diseases it should be viewed either as the precursor of a crisis by hæmorrhage, or as the indication of the supervention of a prominent affection or complication. If the cessation of internal heat be attended by free secretion or excretion, the prognosis is favourable; but if it occur suddenly, or is followed by a feeling of cold, the prognosis is bad. The sensation of heat may change its seat, especially in nervous fevers, influenza, hysteria, hypochondriasis, and diseases of the abdominal viscera; but the amount of danger in these complaints depends upon the concomitant symptoms and signs; and chiefly upon the other conditions of the surface, with which the sensation of heat or of cold is generally associated (see § 22, *et seq.*).

87½. (*e*) Feelings of *muscular fatigue*, of *general malaise*, or of *exhaustion*, or of *vital depression*, or of *sinking*, are chiefly modified grades of that depression of vital power accompanying either the invasion of acute diseases, or the debility consequent upon great excitement. When these feelings are very remarkable on the invasion of acute maladies, they augur a very dangerous attack; and when they become extreme at a far

advanced period, they are then attended by great danger, and they require the administration of very active restoratives, appropriately to the circumstances of the case. (See *arts.* DEBILITY and DISEASE § 67.)

88. *C.* PAIN is a most important symptom, as indicating the seat, the nature, and even the probable result, of disease. It is a warning furnished by nature to convey this information; it both puts the patient on his guard to remove the cause of suffering, and disposes him to use the means for this purpose. It farther tends to rouse the conservative influence of life—to excite the vital resistance—against the extension of disease, to prevent dangerous or fatal sinking, and to bring about a salutary reaction. In order, however, that pain should have these salutary effects, it should not be allowed to be excessive or intense for a prolonged period, or without having recourse to means to assuage it; the expression of it, when excessive, ought not to be suppressed; and the effect of its continuance, as well as the several phenomena which accompany it, should be closely observed, and carefully compared and estimated. In our investigations into the nature and seat of pain, there are several things to be ascertained, especially its *duration* and mode of *accession*, its exact *seat* and *relations*, its *character* and *severity*, and the influence produced upon it by different degrees of *pressure*, *percussion*, and *temperature*.

89. *a. Pain* may be either *dull*, *obtuse*, or *heavy*, or *aching*, in connexion with congestions and chronic inflammations, or with acute or chronic inflammations of parenchymatous organs and mucous membranes, in cases of effusion into internal cavities or of internal tumour, and sometimes in the congestions and vascular determinations preceding hæmorrhages.

90. *b.* A *gnawing* or *lacerating pain* generally accompanies rheumatism, gout, cancerous disease, &c. A *perforating* or *boring pain* is felt chiefly in diseases of the periosteum and bones, in secondary or tertiary syphilis, in scurvy, especially at night, in the long bones and joints. A *burning pain* attends gout, severe or intense inflammation of the integuments, erysipelas, carbuncles. A *pungent* or *tensive pain*, often with more or less of a sensation of burning, is experienced in acute inflammations of serous membranes; and in its most violent or stabbing form, in inflammation of fibrous or sero-fibrous tissues, and in those affections of the nerves which have usually been termed neuralgic, and which proceed either from inflammation of the sheath or neurilemma, or from irritation at or near the origin of the nerve. This kind of pain, also, especially when occurring at short intervals and of brief duration, and characterized by violent dartings, accompanies the passing of gall-stones, or of calculi along the ureters. A *cutting* or *darting pain* also attends cancer, and inflammation of nerves, in which latter it is often accompanied with a sense of numbness in the parts distant from the seat of pain, and is often, in this as well as in the other maladies just mentioned, characterized by a feeling of heat or burning.

91. *c.* A *pulsating pain* indicates extreme congestion of a parenchymatous organ, or the passage of inflammation into suppuration—commonly this latter when it is attended by horripilations, chills, or rigours (§ 19). When this pain is preceded by a feeling of tension, the existence of abscess, or of effusion into a shut cavity, may be inferred. A *pricking*, *stinging*, or *tickling pain* may accompany acute eruptions on the skin, gout, organic diseases of the brain, spinal cord, or their membranes, especially when these pains are felt in the extremities, and are attended or are interrupted by a feeling of numbness (§ 41), also hysteria and hypochondriasis. A *violent twisting*, *spasmodic*, or *griping pain* accompanies dysentery, ileus, gastralgia, enteralgia, strangulated hernia, and obstructions in the bowels. A *forcing*, *acute pain* often also attends these maladies, the passage of concretions along canals, and diseases of the uterus and ovaria.

92. *d. The seat and duration of pain* suggest interesting considerations. The *seat*, however, should not always be received as a correct indication of the seat or origin of the disease; for, even in inflammations, the pain may be referred to parts at a distance from the seat of disease: thus, in pleuritis, the pain may be felt in the iliac regions, or below the false ribs; and, when a limited portion of the spinal cord or membranes is influenced, the pain may be referred to the distant extremities of nerves having relations with the seat of disease. This topic is, however, more fully illustrated in the article SYMPATHY.

93. The *duration* or continuance of pain is most various. It may be *transient*, *wandering*, *intermittent*, *remittent*, or *permanent*. *Transient pains* occur in hysteria, in gout, rheumatism, hypochondriasis, in catarrhal fevers, and influenza, from irritation of the digestive organs, from accumulations of bile in the ducts or gall-bladder, and from irritation of the nervous centres of animal life. *Intermittence* or *remittence* of pain shows its seat in the nervous system, especially of animal life, and occurs chiefly in those diseases in which this system in some part of its ramifications is more or less implicated, as in neuralgia, periodic fevers, rheumatism, gout, hysteria, &c. *Continued* or fixed pain indicates the more or less permanent nature of the malady, as inflammation, disorganization, rheumatism, syphilis. *Wandering pains* occur during the accession of acute or febrile diseases, in hysteria, hypochondriasis, syphilis, rheumatism, atonic gout, and in functional disorders of the digestive organs, especially the liver and stomach.

94. *e. Pressure* and *percussion* produce certain effects on pain which are extremely important in diagnosis. *Tenderness*, or incapability of enduring pressure, or increase of pain on pressure, is a sign of inflammation or of organic change. But in nervous, hysterical, and hypochondriacal persons, the tenderness may not be connected with increase of pain on pressure—may be merely a morbid, superficial sensation, or an intolerance of touch; for, when pressure is made, when the patient's attention is distracted, or firmly or forcibly, the pain is either not increased or is diminished, showing the true nervous character of the tenderness or pain in these. *Diminution* of pain on pressure characterizes colic, chronic rheumatism, and nervous pains or pure neuralgia, when not occasioned by inflammation of the nerve or its sheath. *Increased pain* on pressure attends inflammation, organic changes, the results of, or the attendants of inflammation, and vascular congestion. Increased or continued pain, the skin being hot or dry, and the pulse hard or rapid, is a sign of progressive inflammatory action; and if the pain become pulsating, with chills,

heats, and sweats, the sweats not diminishing the pain or changing its pulsating character, suppuration may be inferred. *Prolonged pain*, with more or less tenderness on pressure, indicates organic change, especially if emaciation advances, and if the secretions or excretions be disordered. A *decrease* of pain after the secretions and excretions become free or augmented is always a favourable sign. A *cessation* of pain coinciding with remission of fever and increase of the natural discharges is also a favourable symptom; but a sudden cessation, without abatement of the other symptoms, or with the appearance of others which are unfavourable, indicates the occurrence of gangrene, or of rapid vital sinking. *Pain* or *spasm*, or the association of both, in parts which are paralyzed either as to motion or sensation, is an indication of inflammatory action, or of inflammatory softening in or near those parts of the nervous centres, with which the nerves of the affected parts have intimate relations. Severe pains or spasms in a different extremity or part from that which is paralyzed, indicate the presence or extension of inflammatory action to those parts of the nervous centres connected with the origins of the nerves of the pained extremity. (See *arts.* HEADACHE, IRRITATION, NEURALGIA, PARALYSIS, SPASM, &c.)

95. IX. THE MENTAL MANIFESTATIONS furnish numerous signs, in respect both of their individual conditions and morbid associations, and of their connexions with acute and chronic physical disease. But these have been noticed, as far as my limits admit, when treating of DELIRIUM, COMA, SLEEPING, and SLEEPLESSNESS, and of the different grades and forms of INSANITY, in which latter especially, as well as in the other articles, I believe these subjects have been fully discussed.

96. III. THE SYMPTOMS AND SIGNS OF THE DIGESTIVE FUNCTIONS AND ORGANS. — These functions and organs are essentially vital, and are under the dominion of the organic nervous system—the primary or chief factor of life—excepting at the entrance to and outlet from these organs; and to these situations accessory influences are imparted from the cerebro-spinal or animal nervous system. The states and disorders of these functions and organs, from the entrance to them by the mouth to the outlet by the anus, are intimately connected with the conditions of the organic nervous system; while this entrance and this outlet are controlled by the cerebro-spinal nervous influence. Thus the functions of the several digestive organs are manifestations of the conditions of organic nervous power, and the functions of these portals are indications of states of cerebro-spinal influence. The symptoms and signs furnished by the digestive functions and organs comprise those evinced by the *teeth* and *gums*, by the *tongue* and *throat*, by *deglutition*, by the *appetite for food* or *drink*, by the functions of *digestion*, by *fæcation* and *defæcation*, and by the *abdominal regions*.

97. *A.* THE MOUTH, &c.—(*a*) *The teeth* are perfect and enduring in persons of sound constitution, their soundness often continuing to advanced age. Their early decay indicates either constitutional vice, or impaired constitutional power, or prolonged disorder of the digestive functions. The teeth are variously affected by acute or chronic maladies. *Chattering* of the teeth occurs in the cold stage of fevers and invasion of acute diseases, and indicates a severe form of the supervening malady. It is also observed in hysteria, but in rare instances, and in dangerous shocks of the nervous system It is most remarkable in the cold stage of agues. *Grinding* of the teeth during sleep is common in children, and is a sign either of intestinal worms or of cerebral disease. If it occur in children in connexion with brightness of the eyes, contracted pupils, flushing of the cheeks, or startings in sleep, then convulsions, cerebral meningitis, scrofulous softening of the brain, or other changes may be apprehended. In aged persons it sometimes precedes an attack of apoplexy or palsy. If it occur in continued or in exanthematous fevers, it renders the prognosis more unfavourable, as evincing a serious cerebral complication. It may, however, take place in irritable persons and children, without any serious disorder, especially during dentition in children.

98. The teeth are often covered with a grayish mucus in catarrhal fevers, in gastric disorders, and in inflammations of the digestive and respiratory organs. They are more copiously covered by mucus or sordes of a dark or brown colour, often extending to the lips and gums, in low, adynamic, or putro-adynamic fevers; the quantity and darkness of the colour evincing the amount of danger. The accumulation of tartar or cretaceous matter around the teeth, at the margins of the gums, shows a disposition to calculous, gravelly, or gouty affections.

99. The teeth sometimes become inordinately sensitive in nervous disorders, in disorders of the digestive organs, and in acidity of the stomach. They are loose in scurvy, in purpura, and in mercurial salivation. They appear elongated, owing to retraction of the gums, in scurvy, sometimes in scrofula, and often in chronic gastritis and other prolonged disorders of the digestive organs. They become carious owing to the excessive use of saccharine and acid substances, especially in early life, to the abuse of mercury, to chronic indigestion, and to rickety and scrofulous habits of the body. Improper diet, at an early age, favours the occurrence of this change in the teeth; diseased teeth are always an indication of pre-existing disorder of the digestive organs, often connected with the abuse of spirituous liquors, or of sugar in its various uses; and they generally evince impaired vital power and resistance.

100. (*b*) *The gums* and lips are pale in anæmia and chlorosis, and after excessive hæmorrhage or injudicious blood-letting. When they are covered by a similar mucus to that observed on the teeth (§ 98), the diagnosis and prognosis are as above stated. They present a blue margin in cases of slow poisoning or contamination by the preparations of lead; and a red, spongy, and swollen appearance from the use of mercury, from prolonged disorder of the digestive organs, in diabetes, in incipient scurvy, and in purpura. They become of a darker hue, more spongy, more retracted, and more disposed to bleed in scurvy and in chronic stomatitis. They are still more seriously affected in the ulcerative, gangrenous, and phagedenic forms of this malady. (See *art.* STOMATITIS.)

101. *B.* THE TONGUE presents diversified appearances, depending, 1st. Upon the states of the several digestive functions; 2d. Upon the nature of the disease; and, 3d. Upon the existing constitutional disturbance, chiefly as respects

organic nervous power, vascular action, and sanguineous contamination. In estimating the signs furnished by the tongue, it should not be overlooked that it may be coloured by medicines, by food, and by drink, and be rendered drier than natural by breathing through the mouth; but it is much less disposed to be affected by these causes in health than in disease.

102. *a. The mode of protruding*, of holding out, and of withdrawing the tongue is always deserving attention. The tongue is protruded with difficulty in comatose, apoplectic, and paralytic cases, owing chiefly to a weakened or paralyzed state of the organ; and, in the more dangerous states of these diseases, it is either imperfectly protruded or not at all. In this latter case, either the existing insensibility prevents any attempt to execute the command, or the muscular power is so paralyzed as to prevent the act of volition from being performed; and if it be executed, the tongue often remains protruded. A slow or tremulous protrusion, or tremour during the protrusion, of the tongue, is observed in many nervous complaints attended by debility or exhaustion, and more especially in low, typhoid, or adynamic fevers. A ready, quick, and steady protrusion and withdrawal of the tongue occur in diseases of excitement, in inflammatory affections, and whenever organic nervous power is not materially depressed, or when the cerebro-spinal influence is not impaired or suppressed, as in the stupor or sopor of low fever, or in comatose states. As long as the perceptive faculty is unimpaired and muscular power is not remarkably reduced or paralyzed, these acts are usually naturally performed. The tongue is protruded to one side in cases of paralysis, especially in hemiplegia; but there is no certain correspondence between the side to which it is protruded and the affected side.

103. *b. The size* of the tongue varies in different diseases, and with variation in size there is often also variation in *form*. *Increased size* is caused by inflammatory action chiefly, this action being either *primary* (see Tongue, *inflammation of*) or *consecutive*. It is the latter chiefly as a complication of angina, or scarlet fever, small-pox, of hysteria, epilepsy, syphilis, and as a consequence of mercurial action or of poisons. The enlargement may, instead of being acute, as in these cases, be chronic, and the result of an hypertrophy or increased irritation of its tissues. With the enlargement may be connected several other appearances, which indicate prolonged chronic or visceral disease, as well as impaired constitutional or organic nervous power. The chief of these are, 1st. A broad, flabby state, with more or less intumescence, and with indentations by the teeth on the edges of the tongue; 2d. A fissured or sulcated condition, the tongue appearing lobulated as well as enlarged; and, 3d. A tumid and livid state, the surface being covered by a yellowish load, or a milk or cream-like mucus. The first and second of these occur chiefly in prolonged disorder of the digestive organs, or as consequences of mercurial action, or in connexion with hepatic disease, &c.; the third more frequently as a result of diseases of the lungs, heart, and urinary and uterine organs. Swelling of the tongue is a dangerous sign in cerebral affections, and in cases of poisoning. It is also very unfavourable in exanthematous or continued fevers, especially the putro-adynamic and pestilential, and in scurvy, particularly when the swelling is great, or when the tongue is dark or livid, or is covered by a sanguineous or sanious exudation.

104. *c. Diminution* of the size of the tongue is usually much less remarkable than enlargement. The diminution may be more apparent than real, owing to contraction of the organ laterally, as well as to a partial retraction. In these cases the tongue is narrow and pointed, and indicates a most dangerous state of typhus, typhoid, and adynamic fevers, of acute irritation or inflammation of the digestive organs, or of the brain or membranes, especially when it is also dry and red at the point and edges. Actual diminution of the size of the tongue is comparatively rare, as emaciation, even when extreme, affects but little this organ.

105. *d. The form* of the tongue is not materially different from that already stated—the chief modifications being in the breadth of the organ in relation to the length, in the narrowness and thickness of it, and in the fissured or lobulated appearance of its upper surface. But this surface may present other conditions. It may be so deeply indented or furrowed, or fissured, along the centre, from the root to nearly the point, as to appear almost divided into two halves, the sides of this indentation sometimes being more or less furred (§ 110). This state occurs chiefly in chronic disease of the abdominal viscera, especially of the digestive organs, and indicates a most obstinate, although not a dangerous disease. The tongue, when protruded, may present either a convex or a concave appearance of its superior surface, or a double convexity, owing to the furrow along the centre. When either of these states is very remarkable, then more or less irritation or inflammatory action of the abdominal organs is very frequently present. The lobulated state of the upper surface of the tongue is caused by more or less numerous fissures or indentations in various directions. It is generally connected with a tumid and convex condition of this surface, and is most frequently seen in chronic diseases of the liver or other digestive organs, in diseases of the heart, and in disorders of the female sexual organs.

106. *e. The humidity* of the tongue proceeds from the salivary secretion poured into the mouth, and very partially from the mucous secretions in the vicinity, and from the exhalations taking place in the surface of this part and the vicinity. The presence or absence of this humidity—the moisture or dryness of the tongue, is most important as respects the other states of this organ, and as regards the secretions and excretions, and the conditions of vital power and of the circulating fluids. *Humidity* of the tongue is often very remarkable in cases of debility when all the secretions are free, and the blood uncontaminated. When it is very considerable, and is attended by *softness* of the organ, and by a flattened state of the fur, when fur has been present, as in convalescence from acute diseases, either tonics are required or lowering means should be avoided. When the tongue has been dry or furred, or both, then returning humidity and softness are always excellent signs, and especially when the surface becomes also more clean, or when the fur disappears or is flattened, the tongue and mouth being sufficiently moist, &c. In acute diseases, the humidity appears first at the sides of the tongue, and gradually extends, the other changes advancing

with the increase of humidity, and being favoured by the state of the salivary secretion. As long as the tongue and mouth continue moist in acute maladies, a favourable opinion as to the issue may be entertained.

107. *f. Dryness* of the tongue is as unfavourable a sign as humidity is favourable. Dryness, however, may be occasioned by breathing through the mouth; but this will seldom produce it in a very marked degree, if febrile or inflammatory action be not present. Dryness is most common in continued fevers, in the exanthemata, in inflammation of the abdominal viscera and of serous membranes, and in various other diseases of an acute and febrile nature. It is most remarkable, and presents either roughness, owing to the parched state of the papillæ, or fur, or a fissured or burned appearance, often with a deeper or darker hue, in the most dangerous states of these maladies. The more extreme of these conditions of the tongue, and especially when they are not attended by thirst, are generally fatal indications. When the tongue has been furred and loaded, and subsequently becomes dry, rough, or hard, and, at the same time, very dark, the furred surface being both dry and dark, or even black, a malignant or almost hopeless state may be inferred, owing chiefly to exhaustion of vital power and contamination of the circulating fluids, with arrest of the secretions. Humidity of the tongue rarely supervenes upon this extreme state, unless this dark appearance has been heightened by the substances taken into the mouth; but in the less remarkable cases the occurrence of humidity often takes place, and is a most favourable sign, inasmuch as it shows a return of the salivary secretion and of the secreting functions generally, especially when the skin also becomes less hot and dry, or more natural or perspirable.

108. *g. The colour* of the tongue should always be observed. The *natural* hue is favourable, and a return to it is an indication of a favourable crisis or change. The tongue may be more or less *pale*, and the pallor is commonly associated with a similar hue of the gums and lips, in cases of anæmia, of chlorosis, after large blood-lettings or hæmorrhages, and during prolonged chronic diseases, and affections of the spleen, owing either to a deficiency or to a poorness of blood. A very *red* tongue occurs chiefly in inflammations of the throat and pharynx, and in the exanthemata. A limitation of the redness to the point and edges is very general in acute irritation or inflammation of the digestive mucous surface, in gastric and bilious fevers, and in remittent and continued fevers, but in those latter the surface and base of the tongue is at the same time loaded, coated, or furred. If the tongue, after having been coated or furred, becomes *very red and clean*, in gastric fevers, and inflammatory or other acute diseases of the digestive or abdominal viscera, without returning strength or other favourable symptoms, a dangerous prognosis may be inferred; and more especially if the febrile symptoms be not abated, if the tongue be dry, and if the redness assume a glossy or varnished appearance. If, with this change, the tongue presents a yellowish red hue, and becomes glossy, dry, and clean, great danger should be anticipated, especially in severe remittents, in bilious fevers, in putro-remittent or adynamic fevers, and in acute diseases of the liver and digestive canal. If the redness pass into a *brown*, *livid*, or *bluish* or deep *leaden hue*, whether the surface of the tongue be also moist or dry, or soft or hard, or furred or coated, or rough, or smooth and glossy, &c., an imperfectly changed, an insufficiently oxygenated, or a contaminated state of the blood may be inferred. This appearance, thus variously associated, according to the nature and stage of the malady, is observed in the most dangerous cases of asthenic or congestive pneumonia and bronchitis, especially when both lungs are affected, in organic diseases of the heart, in asthma, hydrothorax, in dangerous cases of hooping-cough, in the malignant or putro-adynamic, or asthenic forms of exanthematous and continued fevers, in pestilential maladies, in scurvy, and in the last stages of other diseases, or shortly before dissolution.

109. *h.* A *white* tongue is common in catarrhal and febrile disorders, in functional disturbances of the digestive and respiratory organs, and in the premonitory and invading stages of fevers—periodic, exanthematous, and continued—and of inflammations. A *clammy* state of the tongue, with a whitish, or yellowish-white, or milky load on the surface and base, with more or less humidity, is frequently seen in visceral diseases, in inflammatory affections of mucous surfaces, in the early stages of fevers, in connexion with redness of the point and edges, and in puerperal fevers accompanied with a flabby and lurid appearance of the organ. A *loaded* tongue, the load varying in quantity, colour, and consistence, occurs in bilious diseases, in the early stages of periodic and continued fevers, and in most of the maladies in which a clammy state is observed. These states, especially a loaded condition, are frequently complained of in the morning, soon after waking, by persons who are dyspeptic, or whose digestive organs—stomach, liver, or bowels—have been much disordered; or who have been in the habit of taking suppers, or of smoking, or of drinking malt or other liquors previously to retiring to bed.

110. *i.* A *furred* tongue is always a serious indication. The fur resembles the pile on the surface of cotton velvets, and varies in length and thickness. It is often covered by a clammy or dirty mucus, the tongue being also coated on the surface and base by a load of fur and mucus. The colour of the fur varies from a grayish white to a brown or black, the surface generally becoming thus coated, and dry or parched, before the darker hues are observed. The origin of the fur has not been satisfactorily explained; but it may be attributed to a morbid development of the filiform papillæ of the tongue, which become elongated during the progress of disease, and covered by the inspissated and dark mucus, which generally collects in the mouth during the disease in which the tongue is furred. The surface of the fur, especially when thus coated, presents a more or less dark brown or black hue, according to the duration, severity, and danger of the disease, the deepness of the hue, however, being often much increased by the colouring properties of the substances taken into the mouth.

111. A furred state of the tongue is common in inflammations, especially of parenchymatous organs; in severe irritation of mucous surfaces and canals; in continued, exanthematous, typhoid, or adynamic fevers; in diseases of the brain or of its membranes; and in most other acute maladies which advance to a dangerous

condition. In the early stages of inflammations and continued fevers, the filiform papillæ are merely erect and somewhat developed in length, giving the tongue a whitish hue. In the early stages of exanthemata, especially in scarlatina, the fungiform papillæ on the sides, point, and middle, are very much enlarged, and appear very manifestly dispersed through the fur produced by the filiform papillæ. This appearance is also observed in many of the diseases of children, more particularly in those of the digestive organs. The dirty or clammy mucus, so frequently accompanying a furred tongue, loads the papillæ; and, with the progress of these maladies, especially as they proceed to an unfavourable or dangerous state, forms a darker or deeper coat, which often covers the whole upper surface of the organ, either in a continuous crust, or with more or less slight fissures in various directions.

112. The depth of colour, the dryness, the contraction or diminution of the surface of this fur and coating, and of the tongue itself, are important circumstances, and require close attention in the progress of acute diseases. An increase of either, and especially of all of these, indicates a proportionate increase of danger, whereas a diminution of these appearances evinces a favourable issue, more particularly if the tongue becomes more moist and more clean, the fur and load disappearing from the point and sides, and progressively from the surface and base, the colour of the organ becoming, at the same time, more natural. If the coat or crust formed on the tongue be rapidly removed, the surface thereby exposed being glossy, smooth, or fissured, and dark-coloured, or having a raw appearance, the prognosis is not improved by the occurrence. This change often proceeds from self-contamination of the blood in the course of the disease, the tongue frequently becoming still more dark, contracted, dry, and even hard, towards a fatal issue.

113. With slight development of the filiform papillæ, the tongue sometimes presents *patches* which appear partially deprived either of papillæ or of the epithelium covering the upper surface, which, at the same time, is broad or flabby, the edges of the tongue being occasionally also indented by the teeth. This appearance is observed chiefly in protracted disorders of the digestive organs, and in hypochondriasis, hysteria, and diseases of the uterine organs. It is always an indication of protracted and intractable disorder.

114. *k. An aphthous state* of the tongue, affecting chiefly the point and edges, is often observed in the last or fatal stage of tubercular consumption, and of several other visceral diseases. It is always a serious indication in the diseases of adults, even when unconnected with phthisis, especially in diseases of the digestive and urinary organs. (See *arts.* STOMATITIS, THRUSH, and TONGUE, *diseases of.*)

115. *l. The temperature* of the tongue is seldom materially affected. It is somewhat *increased* in inflammatory fevers, and in the early stages of exanthematous and continued fevers. It is diminished in all diseases, or towards the fatal issue of all maladies in which the tongue presents a livid or dark hue. It is most diminished, becoming cool or cold as pestilential cholera proceeds to a fatal termination.

116. *C.* THE SALIVARY SECRETION is intimately connected with the state of the tongue and mouth in disease, and with the indications furnished by the latter.—*a. Diminution* of the secretion, both of saliva and mucus, occurs at the commencement, and during the greater part of the progress of febrile and acute diseases; and with this diminution, which often amounts almost to suppression, these secretions become thick, viscid, or clammy, especially in continued, exanthematous, and low fevers, and in affections of the brain. They often assume a dark or dirty hue, thereby loading the tongue, and often collecting about the teeth, gums, and lips. The bloody or sanious appearance of the interior of the mouth observed in scurvy and hæmagastric pestilence, is not produced by the saliva and mucus, but by the admixture with these of the semi-dissolved blood, exuded from the surfaces of the tongue and gums. A return of the salivary and mucus secretions after their diminution or suppression is always a very favourable sign, the detachment of the fur and load on the tongue during incipient convalescence being thereby favoured.

117. *b. Increased* salivary secretion—*ptyalism*—may be produced by any stimulus taken or retained for a time in the mouth. It accompanies various affections of the gums and mouth, and the natural processes of teething in childhood. While it is a salutary indication of teething, the sudden interruption or suppression of it is a very serious occurrence, and is very often a sign of incipient or advanced disease of the brain and its membranes. Ptyalism is produced by the constitutional or local operation of mercurials, iodine and iodides, and various other metallic and poisonous substances. (See *art.* POISONS, *pluries.*) It attends, as a contingent or intercurrent phenomenon, several diseases, as gastric catarrhs, chronic dyspepsia, hypochondriasis, hysteria, diseases of the pancreas, and occasionally small-pox. In the confluent form of this last malady, it is often a favourable symptom; but if it cease suddenly or prematurely, it is generally a fatal indication.

118. *D.* The THROAT *and fauces* present signs of disease, not merely of the digestive canal, but also of the constitution.—*a. Relaxation* of the *uvula* is a symptom of general debility, in connexion either with disorder of the stomach, or with catarrh, or with gastric catarrh, or that state of catarrhal irritation of the digestive and respiratory mucous surfaces which often appears in spring and autumn, in connexion with, or even constituting catarrhal fevers. The elongation of the uvula, the result of relaxation, is often a cause of irritation to the epiglottis, and occasions or aggravates cough. And this having been admitted to more than its full extent, it became a fashion to extirpate the uvula, without any regard to its functions, and without reference to the fact that the want of an uvula may be quite as injurious as an excess of it.*

* [Sir ASTLEY COOPER was strongly opposed to removing any more of the uvula than would reduce it to its natural proportions, for if the whole is removed, fluids cannot be taken without their passing into the nostrils, and without injuring, more or less, the articulation. Moreover, he did not believe that any permanent benefit attended the operation, as the uvula almost invariably acquired again its natural length. We believe the removal of the uvula is very rarely necessary, inasmuch as its enlargement is commonly owing to irritation of the alimentary canal, and will resume its normal proportions when that is quieted. It will sometimes become elongated to twice its usual length in the course of an hour, and, by its contact with the epiglottis, cause a constant hacking cough and sense of choking. In such cases, the patient should be advised to close the mouth and breathe through the nostrils, while the uvula and throat should be touched

119. *b.* The *tonsils* or amygdalæ are often enlarged, either by acute disease — *tonsilitis* — or by a chronic congestion. Sometimes they are enlarged in connexion with elongation of the uvula, and redness, or chronic inflammation, or irritation of the fauces and pharynx. Chronic enlargement of the tonsils is not so frequently a sign of disorder of the digestive organs as of a scrofulous diathesis, or of general derangement of health. In connexion with redness of the fauces, palate, and pharynx, enlargement or redness of the tonsils is an indication of disorder or disease of the digestive organs, of exanthematous and gastric or bilious fevers, and often also of continued and typhoid fevers. This redness of the several parts of the throat, with redness of the point and edges of the tongue, and development of the fungiform papillæ, is very remarkable in the early periods of scarlatina, and frequently also of measles and small-pox. (See also *arts.* THROAT and TONSILS.)

[Whenever the tonsils are found to be enlarged and indurated, and especially when connected with follicular disease, they should be at once removed, and their excision followed in the course of a few days by a topical application to the throat of the solution of nitrate of silver, of the strength of from ℈j. to ʒj. of the salt to one ounce of water. It is now well established that if these organs, when diseased, are not removed, they will be likely to cause follicular disease of the throat by their presence, and if the latter already exists, then other treatment will prove unavailing, as the morbid secretion poured out by their disordered lacunæ will be sufficient to perpetuate the disease. (See "*A Treatise on Diseases of the Air-passages*," &c., by HORACE GREEN, M.D., New York, 1846.)]

120. *c. The secretions* of the throat are often materially affected. With increased redness they may be either diminished or augmented. *Dryness* of the throat attends the commencement or early stage of inflammation of the parts just mentioned (§ 119). And, in cases where an injudicious and officious treatment has removed either the uvula or the tonsils, dryness of the throat, and roughness or change of voice, have rewarded the confiding or credulous patient; the parts concerned in secreting and in distributing a lubricating mucus to the surface of the throat having been extirpated, as if nature had formed them for no purpose. During the more advanced stages of inflammatory irritation, the mucous secretion and watery exhalation from the throat are much *increased*; the same effect follows catarrh, catarrhal fevers, and influenza, in which, as well as contingently on several diseases, increased secretion and exhalation are prominent affections.

121. *E.* DEGLUTITION is often affected owing to disease either of the passages—of the throat, pharynx, and œsophagus — which convey substances into the stomach; or of the brain, or of the structures surrounding and protecting it, especially the base of the brain and medulla oblongata. The diseases of the passages leading to the stomach, and the attending symptoms of difficult and interrupted deglutition, are considered in the articles ŒSOPHAGUS, THROAT, and TONSILS. *Dysphagia*, or difficult deglutition, and *Aphagia*, or impossibility of swallowing, are caused not only by lesions of these parts, but also by diseases of the brain or medulla oblongata, or of their envelopes, and by structural changes implicating the nerves supplying the tongue, pharynx, and upper portion of the œsophagus. When swallowing is materially affected by these latter pathological conditions, then speech and voice are generally more or less disordered, or both deglutition and speech may be altogther lost. I saw a gentleman who had lost the faculties of deglutition, speech, and voice. He complained of no other symptoms referrible to the head or cervical region, and was otherwise in good health. Deglutition partially returned after a time, but the power of articulation was never restored. He died suddenly. The body was not allowed to be inspected. Impaired or lost power of swallowing, with or without loss of speech, but most commonly with partial or complete loss of this faculty, may either be the precursors of a more general attack of palsy or of apoplexy, or be the consequences of an attack of either or of both. But whether ushering in or following a cerebral attack, it is always a most dangerous symptom. When a fatal issue does not supervene, the power of swallowing generally returns, either partially or altogether, before speech or articulation is restored.

122. In all these cases deglutition is impaired or lost owing to paralysis of the muscles concerned in this function, but it may be difficult, painful, impaired, or impossible, in consequence of spasm of these muscles, or of some portion of the œsophagus, as in rabies canina or hydrophobia, and in hysteria, hypochondriasis, &c., in all which the difficulty of swallowing liquids is greater than that of taking more consistent substances. The dysphagia accompanying hysteria and other functional nervous affections is not farther unfavourable than that it indicates a greater severity of these affections. The aphagia of rabies is always a fatal sign, although it generally disappears before dissolution. Painful, difficult, or impaired deglutition is often a symptom of the presence of flatus in the œsophagus, and in these cases spasm of portions of the œsophagus often takes place. When swallowing is affected by this cause, flatulent eructations either precede, accompany, or follow the act, and the patient is generally subject to one or other of the forms of *indigestion*, or to *flatulence* during empty states of the stomach.

123. ii. THE APPETITES FOR DRINK AND FOOD are generally affected by disease.—*A. a. The desire for drink* is *diminished* in several diseases, and is in most of these a very unfavourable symptom, more especially when the tongue and mouth are dry, and other febrile symptoms are severe. In the advanced stages of fever, especially in continued and typhoid fevers, and in the advanced periods of inflammations, particulary of the brain or of its membranes, the absence of thirst, or of a desire for fluids or drinks of any kind, is a most dangerous, although not necessarily a fatal sign, especially in fever. In chronic diseases, the absence of a desire of drink is often present, and is merely an indication of the absence of febrile excitement; but in the last stages of acute diseases and fevers, it shows the existence of a state of sensibility which is either associated with delirium, or about to pass into it, or into unconsciousness or coma.

124. *b. Increased desire* of drinks is generally present in all diseases caused by irritation or inflammation—in febrile maladies during the earlier

twice a day with a strong solution of nitrate of silver. The inflammation will soon subside, and the uvula be reduced to its natural size.]

stages, and before sensibility or consciousness becomes impaired. The supervention of thirst or an increase of it, in the course of chronic disease, is an indication of intercurrent irritation or inflammatory action. Its continuance after critical evacuations is an unfavourable circumstance. Thirst, in its extreme state, is present in the most dangerous cases of choleric pestilence, and in inflammations of the stomach, &c. Thirst, with an inability of drinking, is characteristic of rabies, and sometimes occurs in hysteria, hypochondriasis, but in a much less marked, and in a different form. The sudden sensation of thirst, or absence of the desire of drink, after thirst had been urgent, precedes unconsciousness or coma.

125. *c.* An appetite for *certain kinds of drink*, in preference to others, is observed in several maladies; for iced water, or cold water, or for ice, in the stages of vascular excitement in fevers, inflammations, &c., especially in choleric pestilence and inflammations of the digestive canal; for demulcent and emollient drinks in affections of the respiratory organs; for acid or acetous fluids in chlorosis and disorders of the female sexual organs; for vinous and restorative drinks in diseases of debility, in nervous disorders, and during convalescence from fevers. The appetite for these several kinds of drink is an indication of the nature of the malady, and is, in many cases, in accordance with the intentions of cure which should be adopted. The desire for intoxicating drinks is of itself a malady, which, when not gratified, is attended by distressing symptoms of exhaustion and nervousness.

126. *B. Desire of food*, when moderate or natural, is a favourable symptom in chronic affections.—*a. A diminution* or entire *loss* of this desire is present in most acute, and in many chronic diseases. With increased desire of drink, diminished or lost desire for food is evinced. *Anorexia*, or loss of appetite, is often an indication of the impropriety of taking food, inasmuch as it occurs either in fevers, or in inflammations, or in other diseases of the stomach and digestive organs, in all which food would either be thrown off, or not digested, or be a cause of increased disorder. A diminution merely of the appetite is often caused by want of exercise, especially in the open air, and in aged or paralyzed persons, for whom the demands of nutrition are neither great nor urgent. It is also observed in chronic affections, often, however, with a return of the desire, or with cravings after intervals. The loss of appetite is always complete at the commencement and early stages of fevers and acute diseases. If it continue during convalescence, a relapse, or some important sequela, or structural change, should be inferred.

127. *b. Increased appetite* is, in its various degrees, not only a symptom of disease, but often also a sign of approaching disease. Extremely increased appetite—*Bulimia*—*fames canina*—has been treated of in the article APPETITE. These states only of increase which are observed as a symptom of disease will be noticed at this place. Increased appetite is most frequently a consequence, 1st, of an increased demand for support and nutrition, as occurs during pregnancy, and in convalescence from acute or exhausting maladies; 2d, or of a state of erythism, or irritation of the stomach and digestive organs; 3d, or of irritation or disease of the nervous centres of animal life. Increased appetite in the early stages of fever, or of other acute diseases, is unfavourable, but if it occur in connexion with other signs of improvement, it is a favourable indication. If it be present without other signs of improvement, after anorexia has existed, a dangerous sequela is indicated. Increased appetite is frequent in all verminous diseases, owing to the irritation they produce, and the consumption of nutritious elements; and it is often caused by the use of stimulants—of wine, spices, hot sauces, &c. A great increase of appetite—or a keen, or ravenous, or craving appetite—often ushers in, or precedes for a short period, an attack of apoplexy, or of epilepsy, or palsy, or mania, or phrenitis. Increased appetite very generally attends epilepsy in the intervals between the fits, and is the greatest before a severe paroxysm. It often also accompanies hemiplegia, and it indicates either an attack of apoplexy or an exasperation of the paralytic seizure, at no very distant period. A craving for particular kinds or articles of food is observed in the course of both acute and chronic diseases, and is often suggested to the imagination of the patient by recollections of the past, or by the attendants; but whether these cravings convey a favourable or unfavourable import, depends upon the effects they produce when the patient is allowed food. A craving for unnatural or improper kinds of food—*Pica*—or for articles that are not commonly used for food, sometimes occurs during pregnancy, in chlorosis, and in the course of several disorders of the female sexual organs. (See *art.* APPETITE, VITIATED.)

128. If increased appetite become changed to loss of appetite, or to loathing of food upon taking a small portion only, chronic gastritis or structural change in the stomach may be inferred. A desire for animal food early in febrile diseases, or previously to convalescence, is an unfavourable sign. A keen appetite is generally produced by exercise in the open air; but it is also often the result of habit, and of want of occupation, either mental or physical, especially when indulged. Excessive use of animal food is often progressive, the use of certain kinds creating an increased desire for them, especially of pork. Persons who have thus indulged their appetite generally die prematurely, or seldom live beyond middle age, and are either carried off by apoplexy, by a mixed epileptic and apoplectic seizure, or become hemiplegic. If attacked by continued fever, or by small-pox or scarlet fever, they seldom recover, the malady assuming either a comatose or a putro-adynamic form.

129. *c. Loathing of food*, and *nausea* excited by certain kinds of food, are generally observed in the premonitory period of fevers and acute diseases, also in affections of the stomach. A dislike of flesh meats is very remarkable in these cases. A loathing of certain kinds of food is frequent in delicate, nervous, hysterical, and hypochondriacal persons. When it depends upon disorder of the digestive organs, nausea, horripilations, and even vomitings or retchings, often supervene. Prolonged loathing of food in chronic diseases augurs the presence of organic lesions. The occurrence of loathing in convalescence indicates either a relapse, or the supervention of visceral change.

130. *d. Nausea* may proceed either from the state of the digestive organs, especially of the stomach, or from the nervous systems of organic and animal life. The digestive organs sympa-

thize, through the medium chiefly of the organic nerves, with all the other abdominal and pelvic viscera, the stomach evincing this sympathy more particularly by nausea or vomiting. The nausea sometimes observed in hysteria, in pregnancy, and in hypochondriasis, is generally also sympathetic of irritation transmitted through the medium of the ganglial nerves to the stomach. Nausea on the invasion, or at an early stage, of continued and exanthematous fevers, is only an indication of the marked participation in the disorder of the whole economy which the stomach generally evinces. Nausea, often attended by vomiting, accompanies epileptic seizures and diseases of the brain; and in these it is always a very serious, or even a most dangerous symptom. Nausea may be produced by a disgusting sight, or even by the recollection of such; and in these cases the impression is conveyed from the brain, as in cases of organic lesions of the brain, by the communicating nerves to the organic nerves or ganglia supplying the stomach. The nausea and sickness produced by sea-voyages have been attributed to affection of the brain sympathetically conveyed to the stomach, but they appear to be more directly owing to an affection of the semilunar and other ganglia, than to the state of the brain, which seldom betrays much disorder in cases of sea-sickness. Vomiting consequent upon fæcal obstruction is a most dangerous symptom, and is always fatal when the vomited matters have a fæcal odour. (See *art.* VOMITING.)

131. *c. Various other symptomatic affections* of the stomach occur, and furnish important information as to the nature, seat, and issue of disease. These affections are eructations, heartburning, retchings, and rumination, and are described, with their various relations, in the articles FLATULENCE, INDIGESTION, PYROSIS, RUMINATION, and VOMITING. To these I must refer the reader, and only adduce at this place a few remarks respecting flatulent and other eructations as a symptom of disease. *Eructations* either are flatulent, or consist of fluids or of semi-digested articles, which may be sour or acid, or saltish, or alkaline, but very rarely the latter. Flatulent eructations occur not only in most affections of the stomach, but also congestions and torpor of the liver, and in obstructions to the functions of this organ. They frequently depend upon a gouty diathesis, and attend, but more generally precede, an attack of this disease. They are common also in hysteria and hypochondriasis; the flatulence often rising in the œsophagus, and remaining for a time confined there by spasm, increasing disorder by pressing upon the heart and large vessels. Even when flatulence and flatulent eructations depend upon the diseases now mentioned, and especially when connected with biliary obstruction, it is more or less associated with acidity of the prima via. Fluid eructations often proceed from overloading the stomach, and from organic lesions of the stomach, or liver, or spleen, or pancreas; and in these diseases they may be either tasteless, or sour, or saltish. These may also precede an attack of gout, or accompany calculous affections; but when they are of long continuance, or are not materially influenced by treatment, they should be then referred to organic lesions either of the stomach or of one of the collatitious organs. It should, however, not be overlooked that the most dangerous diseases of these may occur without these eructations appearing in a very prominent form. As to the signs furnished by appearances of matters thrown off the stomach, see the article VOMITING.

132. iii. INTESTINAL FLATULENCE, as well as gastric flatulence, should not be imputed to decomposition of the ingesta, or of the contents of the canal, owing to their retention, but rather to irritation of the mucous surface, in connexion with impaired tone of the muscular coat, and with general debility. Although certain ingesta may favour the generation of flatulence, or even furnish a portion of the gases producing it, especially in cases of intestinal flatulence, yet it cannot be disputed that the gases which accumulate in the digestive canal are chiefly an exhalation from the villous surface. In some cases, especially at an advanced stage of diseases of the digestive tube, the accumulation of gas occasions a tense and tympanitic state of the abdomen, and generally increases the severity of the disease and the sufferings of the patient. Gaseous collections in the stomach or bowels, or in both, are apt to occur in many diseases, as a contingent and intercurrent phenomenon; but in other maladies they are more distinctive symptoms, and should receive due attention, as evincing not merely the nature, but also the issue of the disease. These collections are most frequently formed in very young and in aged subjects; in persons of sedentary habits; in catarrhal irritation of the stomach and bowels; in the several affections and maladies of these viscera, and of the associated and connected organs; in the gouty diathesis and in the atonic forms of gout; in hysteria and hypochondriasis; in puerperal and adynamic fevers; and in obstructions of the intestines by any mechanical or other cause. These symptoms are aggravated by certain kinds of ingesta, especially by raw or bulky vegetables, and by peas, beans, or any preparations of these, also by hot spices, or by irritating and indigestible substances.

133. When the gaseous exhalation is attended by rumbling noises—by *borborygmi*—as in hysteria, a spasmodic or an irregular action of the muscular coats of the canal is present, propelling the distending flatus in various directions. Borborygmi in the course of low fevers sometimes precede a favourable crisis. The discharge of flatus by eructation is often of service in the more severe diseases in which gastric or intestinal flatulence are prominent symptoms; but the escape of it *per anum* is much more favourable, especially in ileus, in colicky affections, and in obstructions of the bowels. Intestinal, as well as gastric flatulence, is generally connected with acidity of the bowels, and often also with obstructed or morbid states of the biliary and intestinal secretions and excretions, and not only with these, but often also with a self-contaminated state of the circulating fluids, especially in the portal vessels. These states are more particularly manifested in the atonic forms of gout, in adynamic fevers, and occasionally in calculous or gravelly affections. In these diseases, and contingently in many cases of other complaints, the deficiency of a healthy bile not merely renders the villous surface more prone to exhale a gaseous fluid, but also favours morbid changes in the intestinal contents, the fæcal excretions being morbid in colour, consistence, and smell, the odour being sour and offensive.

134. iv. THE INTESTINAL EVACUATIONS should receive the most attentive examinations in all dis-

cases, but particularly in those which are severe or obstinate; and these examinations should be made in respect of the successive evacuations passed from the period of the previous visit. An inspection of the tongue, mouth, and throat, and an examination of the several regions of the abdomen, by pressure and percussion, should also be made, either immediately after or before, generally after, the stools have been examined, inasmuch as the state of these may suggest modifications in the examination of the abdomen.

135. The intestinal evacuations may be either too few or too frequent—after protracted intervals, or at unusually short intervals. They may be variously disordered or unhealthy, and the discharge of them may be preceded and attended by much and diversified disorder. These severally as well as in connexion will direct the diagnosis and prognosis of the physician. The derangements of defæcation—the disorders in which either the retention, or the frequent discharge of the fæces, depends chiefly upon the state of the digestive canal, have been fully described in the articles Costiveness and Constipation, Colic, Ileus, Concretions in the intestines, &c., and in those on Diarrhœa, Cholera, and Dysentery. These diseases being considered in connexion with the more important complications they present in practice, and with the states of the intestinal evacuations, comparatively little remains to be noticed at this place.

136. *A. Retention or delayed evacuation* of the intestinal contents is observed in various diseases as an important symptom, independently of being itself a distressing disorder. 1st. It is often a symptom of serious diseases of the digestive canal, of the liver, spleen, kidneys, and sexual organs; 2d. It is frequently caused by mechanical obstructions furnished either by the parietes of some portion of the canal, or by substances retained in, or obstructing the passage through, the canal; 3d. It may be entirely symptomatic of disease of the brain, spinal cord, and thin membranes, of hysteria, melancholy, mania, &c.—(*a*) The remarks offered when treating of Costiveness and Constipation, of Colic and of diseases of the Cæcum and of the Colon, sufficiently elucidate many of the most important topics connected with constipation from disorders of the bowels themselves; and in gastritis, enteritis, hepatitis, and in other diseases of the abdominal viscera, costiveness and the appearance of the evacuations claim strict attention; the spontaneous return, or the easy production of intestinal evacuations, and a more natural or healthy appearance of them furnishing a most favourable indication; while a more obstinate retention, either with increase of painful symptoms, or with painful but abortive efforts at evacuation, evinces an increase of danger. In enteritis, the fæcal retention is occasioned chiefly by loss of the muscular or peristaltic action of the inflamed portion of bowel, and by the consequent distention of that and adjoining portions by flatus. The occurrence of evacuations indicates the removal, either partially or altogether, of these and other pathological conditions which caused the retention, and the subsidence of the inflammation, of which these conditions were the consequences.

137. (*b*) The mechanical impediments furnished by portions of the parietes of the digestive canal are either *spasmodic* or *structural*. *Spasm* of portions of the canal interrupting the passage of the fæcal contents towards the anus is very frequently observed in the course of Dysentery, Colic, Lead Colic, Hysteria, Gout, Hypochondriasis, &c., and sometimes contingently on other maladies. In many of these cases, the fæcal discharges are hard, lumpy, scybalous, &c., and are evacuated with antecedent or coetaneous pain or gripings, and often also with flatus. In these complaints, free and copious evacuations and a more natural state of the discharges are favourable circumstances. In most of these, the obstruction to evacuation is not only in the spasmodic state of portions of the bowels, but also partially in the inactive condition of other portions, or in the distention of these portions by flatus. *Structural changes* often take place in the parietes of the intestinal tube, and interrupt the passage of the fæces along the canal, by contracting or stricturing the intestine. Various lesions, external to the bowel, by pressing upon or strangulating a portion of it, produce a similar, or even more rapidly dangerous results. These alterations are severally described in the articles Colon, Digestive Canal and Duodenum, and when treating of Colic, Ileus, Constipation, Dysentery, &c.

138. Various substances, either formed in the digestive organs or passed into the stomach or bowels, and even intus-susceptions of portions of the intestines themselves, occasion fæcal obstruction, and always dangerous, and very often fatal consequences, as fully shown in the places just referred to, and when treating of Concretions, Biliary and Intestinal. Several indigestible substances may be swallowed, owing to a vitiated appetite, and be formed into masses more or less concrete or consistent, causing dangerous or even fatal results. A lady was in the habit of chewing and swallowing sealing-wax, and persisted in the practice for many months. Another, to whom I was also called, swallowed wax in every form, but chiefly as it existed in candles. Three young ladies came under my care who had long been in the habit of chewing and eating paper of various kinds. In all these, at first costiveness, and afterward constipation, with colicky symptoms, and severe suffering, supervened. The perverted appetite was suspected and admitted. The means used to remove the obstruction were successful in all these cases, and brought away large and concrete masses of the substances thus unnaturally taken, mixed with mucus and fæcal accumulations. It is chiefly when intestinal obstructions are produced by one or other of the causes now mentioned, and, in much rarer instances, by intestinal worms, collected in large balls in hardened fæces and mucus, that the most dangerous consequences are to be dreaded from them.

139. (*c*) In all inflammatory and organic diseases of the brain, spinal cord, or their membranes, constipation is a common symptom; but the danger does not depend upon the obstruction to fæcal evacuations in these cases, although it may be increased thereby. In these diseases the obstruction is generally overcome by medicine, but returns if the means for procuring evacuation be not frequently repeated. When vomiting accompanies constipation in these, the danger is increased, yet not in consequence of the latter being more obstinate or irremovable, but of a greater severity of the disease of which this is merely a symptom.

140. When obstruction to fæcal evacuation is followed by vomitings, the prognosis is unfavourable, especially if the obstruction have continued long. The danger increases in these cases if distention and tension of the abdomen, if pain or tenderness, or increased frequency of pulse, great debility or exhaustion, &c., supervene. It is still greater, the result being nearly always fatal, if the vomited matters have a fæcal smell; if flatulent distention be great and be attended by borborygmi, and if hiccough or flatulent eructations be frequent or distressing. If the obstruction be suddenly removed, and evacuations more or less abundant be passed, pain or debility, or irritability of stomach still continuing, the prognosis is very unfavourable. If the pain and intestinal obstruction be suddenly removed, the vomitings, or hiccough, or abdominal distention still continuing, a fatal result will soon follow, and the sooner, the weaker and more rapid and irregular the pulse, and the colder the extremities.

141. If constipation be attended by frequent abortive efforts to evacuate, or by tenesmus or straining, obstruction is generally present in the rectum, and often is produced by internal hæmorrhoids, or by stricture of the rectum, or by an enlarged ovarium or uterus, or by displacement of the uterus, or by enlarged prostate. Costiveness, in tubercular consumption, is more favourable than diarrhœa. An alternation of constipation and diarrhœa indicates serious chronic or structural disease of the digestive organs; and, in children, that the mesenteric glands are affected, chiefly enlarged. If constipation follow the sudden cessation of diarrhœa, and become obstinate, the prognosis is unfavourable; more especially if pain, tenderness, tension or distention of the abdomen be also present, and the tongue become dry or parched.

142. *B. Frequency of the intestinal evacuations* depends much on the age and habits of individuals. Infants evacuate the bowels twice or thrice daily, adults generally once only, sometimes twice, old persons even less frequently, and sedentary persons, who eat little, only once in two, three, or even in several days. Great frequency of evacuation, or purging, is always occasioned by disease of the digestive canal—most frequently by irritation and hyperæmia of the digestive villous surface. The purging, when continuing for some time, constitutes diarrhœa, but when it ceases spontaneously after the bowels are unloaded, or after a short time, from the operation of medicine, it hardly amounts to the latter. Purging or diarrhœa is frequently owing to teething in children, and is a common complication in exanthematous fevers, and in gastro-enteric catarrh. In these cases, it is also pathologically characterized by irritation with hyperæmia of the digestive villous surface. When it follows ingurgitation of food or intoxicating liquors to excess, or fæcal accumulations, or the irruption of accumulated bile into the bowels, it is thus similarly characterized, and generally subsides spontaneously, especially if due abstinence be adopted; but when it occurs as a complication of exanthematous or gastro-enteric fevers, or in child-bed fevers, the spontaneous cessation of it should not be trusted to, means to moderate or to arrest the inordinate action being then required.

143. When diarrhœa occurs in the course of adynamic or putro-adynamic fevers, asthenic inflammation of the intestinal villous surface and of Peyer's glands should be dreaded, and indeed it may have far advanced, especially if the stools present an ochrey appearance. In such cases the danger is very great — very considerable if the diarrhœa have been of some duration, and extremely great if the stools have this appearance, or are intimately mixed with blood. Diarrhœa is also a most dangerous symptom when it supervenes upon chronic disease of the lungs, or of the liver or spleen, and when it is connected with diseased mesenteric glands. Whenever the state of the evacuations shows either a protracted absence of bile or an intermixture of blood, the prognosis should be unfavourable, and at a far advanced period of chronic or of hectic diseases the danger should be considered as very great or extreme. When stools are passed in immediately after substances have been received into the stomach, and more particularly if they have passed but little changed from the state in which they were taken, a fatal result may be expected in the great majority of instances, and disease of the mesenteric glands, and often also of other abdominal viscera, may be inferred.

144. Diarrhœa following vomiting often subsides spontaneously, especially when the cause consists of irritating ingesta or overloading of the stomach. The same prognosis may be entertained if the diarrhœa follow constipation. If diarrhœa and vomiting, with or without spasms, be of considerable duration; if they occasion sinking, &c., or if they be produced by poisons of an irritant and depressing nature, danger should be inferred, especially if spasms be present and continue. (See *art.* Cholera and Choleric Fever of Infants.) In most instances of diarrhœa, the previous history of the case, the diseases of which it is a consequence, or a complication; the existence and character of nervous symptoms; the amount of nervous or vital depression accompanying it; the nature and character of the prevailing diseases and of the dominant epidemic constitution, especially in connexion with the exanthematous and continued fevers of which diarrhœa is so frequent a complication, should severally receive due consideration before we form conclusions either as to the result or as to the indications of cure.

145. If diarrhœa be attended by pains following the course of the colon, or by tormina, then the colon may be considered as the chief seat of the affection. (See *art.* Colon and Dysentery.) If the pains extend down the sacrum, or between the sacrum and pubis to the anus, or if they be accompanied by dysuria or ischuria and by tenesmus, the rectum is also affected. If diarrhœa or dysentery be attended by spasm of the sphincter ani, inflammation often with abrasion of the mucous surface in the vicinity may be inferred. If, in these diseases, the sphincter ani become relaxed or paralyzed, an unfavourable opinion of the result may be entertained, and more especially if this occur in the course of diarrhœa complicating exanthematous, or typhoid, or adynamic fevers.

146. If purging or diarrhœa, occurring in the course of visceral congestions, especially those of the liver or spleen, or in dropsical effusions, or in hypochondriacal affections, or as a sequela of agues, appear to give relief; or be followed by greater animation or increased strength and activity; and if either occur in the course of fevers and other acute diseases, as a critical evacuation,

being moderate in frequency and continuance, and the evacuation of a more natural and healthy character, a very favourable issue may be expected. (See *art.* Crisis.)

147. *C.* The Alvine Evacuations furnish important information as to the nature, complications, and issue of both acute and chronic maladies. The fæces are altered by disease, in form, in consistence, in colour, in odour, in quantity, in the nature of their constituent elements or materials, and in the substances they contain, or that are passed with them.—(*a*) The *form* and *consistence* of the evacuations vary with the age of the subject. The fæces in infants are pulpy and generally without form. In adults, they are usually formed and more consistent, and in aged persons they either continue so, or become much harder and less bulky. At all ages, however, after infancy, they present every grade of consistence, from fluid to solid, according to the states or affections of the digestive organs. In cases of spasmodic or permanent stricture of the rectum or anus, or of internal hæmorrhoids, the evacuation is of small calibre, and often presents the appearance as if the fæcal accumulation were pressed through a diminished aperture, in continuous or broken, but considerable lengths, and of the same diameter. If there be enlargement of the prostate, or displacement of the womb, the evacuation is generally more or less flattened. The discharge may be lumpy, may resemble pigeons' eggs in form, be hard or very consistent, or scybalous. It is generally of these shapes in dysentery, colic, hysteria, sometimes in hypochondriasis, and in several other diseases. In dysentery, these lumps or balls are accompanied either with a serous fluid, or with mucus mixed with blood, or with both, proceeding from the inflammatory irritation of the mucous membrane, accompanying the spasm of the muscular coats and the flatus, which chiefly occasion this form of the fæces in these complaints. Indeed, whenever the stools present this lumpy or scybalous form, a spasmodic and flatulent state of the bowels, especially of the colon, may be inferred; and costiveness is generally present.

148. In some cases, especially in chronic dyspepsia, with impaired action of the liver, the stools are tenacious, figured, and consistent, resembling putty in tenacity and sometimes also in colour; for these stomachic or chologogue purgatives are generally required. In aged and sedentary persons, especially females, and often also when the liver is torpid or obstructed, fæcal matters accumulate in the sigmoid flexure of the colon, and in the rectum, distend the bowel, sometimes beyond the power of reaction or propulsion, and become hard and dry, owing to the absorption of their more fluid constituents. In this state, the lower bowel, especially the rectum, may be closely plugged up, the natural efforts to overcome the obstruction being accompanied with tormina, and continuing abortive until the concrete fæces are removed from the over-distended and obstructed rectum by mechanical means.

149. (*b*) *The colour* of the stools is very materially affected by the ingesta. In children, the fæces, in health, are generally yellowish; in adults, brown; in old persons, dark brown. They are rendered much darker by port-wine or claret; by extract of liquorice, and by most of the dark fruits; and still darker, or nearly black, by all the preparations of iron, and by all articles of diet containing blood, as black puddings. They present a greenish hue, more or less dark or deep, after green vegetables, especially spinach. After rhubarb, they are often yellow, and after magnesia, or sulphur, or both, they are often paler than natural. The preparations of mercury often cause the fæces to assume a greenish hue, probably in consequence of the state of the biliary and intestinal secretions, and of acidity of the prima via. The compound decoction of aloes often imparts a darker hue to the stools.

150. (*c*) *The odour* of the evacuations seldom continues the same as in health, in either acute or chronic diseases, and, when they return to their natural odour and colour, the circumstance is favourable. The more offensive the odour of the stools, the disorder of the intestinal secretions and excretions, the accumulations of them in the prima via, and the depression of vital power, may, either severally or conjoined, be inferred to have been also the more remarkable, unless, indeed, some preparation of sulphur have been taken and given the discharges the odour of sulphuretted hydrogen. If the stools have an earthy smell, and more especially if they have the odour of raw flesh or of putrid meat, a most unfavourable prognosis should be given, especially in gastric or intestinal fevers, in dysentery, or in other diseases implicating the bowels. When the stools have a sour smell, then diarrhœa, or obstructed biliary discharge, or both, are generally present, and acidity of the intestinal contents clearly exists. This symptom is frequent in the diarrhœa of infants and children, and previously to or during an attack of gout or rheumatism. The stools in pestilential and infectious maladies have a most offensive odour, which is peculiar to each malady, as in choleric pestilence, small-pox, &c.

151. (*d*) *The colour* of the stools is variously changed in disease. It is pale, grayish, clay-like, or nearly white, in all cases of biliary obstruction, whether accompanied with jaundice or not. In the more chronic biliary obstructions, and in the darker shades of jaundice, the colouring and other ingredients of the bile are altogether wanting, the stools are nearly white, unless when partially coloured by the ingesta, and the slightest indications of the presence of bile in the stools are to be viewed as a favourable occurrence. A greenish hue of the stools occurs in several disorders of the digestive organs, and in scrofulous or other organic diseases of the brain. A deep brown or greenish-brown colour of the stools is generally owing to the passage of bile, which had been accumulated for some time in the gall-bladder and hepatic ducts, into the bowels; and a yellowish or bright yellow tint may be imputed to the passage of recently-formed bile into the intestines. Black stools are generally produced by the presence of blood, which may have passed into the stomach either from the nose, gums, or mouth, or from the pharynx, or may have exuded from the internal surface of the stomach or small intestines. When blood is partially digested and intimately mixed with the contents of the bowels, the uniformly black hue presented by the fæces has been ascribed to black bile, which had been long retained in the biliary apparatus; others, admitting that this colour is produced by blood, have believed that the blood has escaped from the secreting structure of the liver along the ducts. In favour of this latter opinion we have no satisfactory evidence. The source of the colour in these

doubtful cases may be determined by diluting the stools, when they will assume a more determinate red or green, according as the colour is owing to blood or to bile. An ochrey colour of the stools is generally produced by numerous ulcers seated in the glands of the villous surface, the blood exuded in small quantities from these being intimately mixed with the contents of the intestines, which are usually in these cases more or less fluid.

152. When blood is exuded in small quantity in any portion of the digestive canal above the valve of the cæcum, it is generally mixed intimately with the fæces. But, even when poured out in the small intestines, it may be passed by stool almost pure, although often grumous and uncoagulable, when the quantity is considerable or large, or the bowels irritable. Blood, imperfectly mixed with fæcal matters, dark coloured and uncoagulated, may have come from either the small or large intestines. When it proceeds from the latter, it is often pure, red, and uncoagulable, and generally precedes or accompanies the evacuation. When it follows the passage of fæces, it commonly proceeds from the rectum, and is a consequence of internal piles. The blood thus discharged per anum, either alone or mixed with fæces, may be an exudation from an irritated portion of the villous surface, or a discharge from an ulcer or ulcers, or from a diseased vein, or an exudation occasioned by the association of irritation with a semi-dissolved condition of the blood itself. Bloody stools, either ochrey, black, red, reddish-brown, &c., occur in adynamic or typhoid fevers, in scurvy, in purpura, in organic diseases of the liver or spleen, in dysentery, in cancer implicating the digestive canal, in vicarious menstruation, hæmorrhoids, and contingently on several other maladies. Although the quantity of blood extravasated in these diseases may be barely sufficient to colour the stool, yet it may be so great in other cases as to excite fears of speedy dissolution, especially in fevers and in organic lesions of the liver or spleen. These excessive hæmorrhages are always dangerous, especially in the more advanced stages of adynamic fevers. Nevertheless, recovery sometimes takes place even in persons considerably advanced in life. I lately saw, within a short period of each other, two cases of this kind, with my friends Messrs. Houlton, senior and junior; and in these, although the loss of blood was remarkably great, recovery took place in both. The quantity of blood may be very small, or may merely streak the mucus, or discolour the serum in which it is passed, and yet the danger may be extreme, as in ileus, volvulus, or intus-susceptions, in enteritis, in dysentery, the attendant symptoms more prominently evincing the danger. A raw, earthy, or putrid odour of the stools, in these cases, is the most unfavourable sign which can accompany the presence of blood in the stools, whatever may be its quantity.

153. The discharge of blood by stool in moderate quantity may produce relief in several diseases, especially in those of the liver or spleen, and in hæmorrhoids. But the relief may be only temporary, inasmuch as the disease or lesion which occasioned it may not be removed by it, and may proceed after a period of relief, this discharge recurring, or some other results being produced. In all cases of this kind the prognosis should depend upon the effects produced by the loss, by the existence or non-existence of anæmia or of vital sinking; but when such discharge occurs in adynamic fevers, whatever may be the quantity—even no more than may be sufficient to impart an ochrey appearance to the stools, then great danger is present.

154. (*e*) *Bile* may be present in the evacuations in every conceivable quantity. The *stools* may even consist almost entirely of bile, or they may not contain a particle of it, as in choleric pestilence and in obstructive diseases of the biliary organs. A brown or gingerbread-colour of the stools indicates a due proportion of both cystic and hepatic bile; a bright but deep orange hue evinces a preponderance of hepatic bile, and, when the stools consist chiefly of a fluid of this tint, becoming darker after it is passed, then they may be viewed as bilious, or consisting in a great measure of bile mixed with more or less fæcal matters. Superabundance of bile in the stools is generally caused by chologogue purgatives prescribed at a time when the biliary ducts and gall-bladder have been loaded with this secretion, or by excitement of the liver in connexion with the influence of high ranges of temperature, or with passion or intemperance, or by any cause productive of irritation of the duodenum or of the common bile-duct.

155. The stools may present various forms and grades of consistence, both when well coloured and abounding with bile, and when deficient in colour and in bile. When thus deficient, they may be watery or serous, as in diarrhœa and pestilential cholera, or pultaceous or thin, as in jaundice, or in torpor and various states of obstruction of the liver, or costive or hard in rarer cases of biliary obstruction, either with or without jaundice. Deficiency of bile, the stools presenting either of the characters just mentioned, but most frequently a thin or pultaceous consistence, is a symptom of torpor of the liver, as in many persons who have resided long in an intertropical climate, of obstruction of the ducts from constriction or contraction consequent upon inflammation, or from the impaction of a biliary calculus, and of the several organic changes described in the articles Jaundice, Gall-bladder and Ducts, Liver, &c.

156. (*f*) The stools may contain more or less *serum*, as in the serous diarrhœa, which proceeds chiefly from inflammatory irritation of the mucous surface of the intestines, and which presents a brownish or dark brown hue in the more chronic cases, and when the liver or spleen is implicated; or they may consist almost entirely of serum, containing small albuminous flocculi, and present a pale and turbid appearance, or resemble rice-water, as in the diarrhœa of choleric pestilence, in which they are frequent and most abundant, and constitute the most dangerous symptoms of the malady. The continuance of pale, turbid, or serous evacuations without any appearance of bile, is always a dangerous circumstance, especially after rational means have been used to arrest them, and to procure a secretion of bile, or when they are very forcibly discharged or squirted from the anus. In pale, watery, or serous stools, insufficiently coloured with bile, especially when passed frequently, and the affection having been of some considerable duration, substances which had been recently taken into the stomach are often passed either but little or not at all changed from the state in which they had been swallowed. This *Lienteric form* of diarrhœa is always most unfavourable, especially in infants and children,

after weaning, or during dentition, or that have been deprived of their nurses' milk. (See *art.* Diarrhœa, § 12.) The occurrence of serous diarrhœa with vomiting in infants and children, in warm summers and autumns, indicates serious and often very dangerous disease, especially when attended by fever. (See *art.* Choleric Fever of Infants.)

157. Various substances, foreign to a natural state of the evacuations, are sometimes found in them, besides serum and blood. These are chiefly mucus, pus, fibro-albuminous exudations, fatty substances, cholestrine, biliary calculi, various kinds of intestinal concretion, worms either dead or living, portions of the mucous coat detached from the subjacent tissues, and even portions of intestine thrown off, in consequence of intus-susception and the consequent changes. These severally require but little remark.—*a. Mucus* occurs in *dysentery* and *diarrhœa*, and is often mixed with serum and pellets or lumps of fæces. In the mucous state of the stools, the follicular apparatus, with the villous surface, is chiefly inflamed; but this appearance may pass into a watery or serous condition, or even into a mixed state, in which the evacuations are more or less streaked with blood as in dysentery. If ulceration supervene, the evacuations contain sanious matters, or blood in larger quantities.—*b. Puriform* stools, or an admixture of *pus*, with fæcal matters, may follow mucous evacuations, as in chronic diarrhœa or chronic dysentery, especially when the puriform matter is much diluted or mixed with mucus; but when it is present alone, or in large quantity and unmixed, or but little mixed with fæces, then the rupture of an abscess, seated either in the liver, or in the spleen, or in the vicinity of the spinal column, into some part of the intestines, may be inferred. A change of mucous to serous, or to muco-puriform, or to serosanguineous, or to sanious, or to puriform stools, or to intestinal hæmorrhage, indicates a progressive advance of disease—generally of structural change; inflammatory irritation advancing to suppuration or ulceration, with the several changes described when treating of Diarrhœa, Dysentery, and Fever.—*c.* The passage of *fatty substances* in the stools occurs in rare instances, and has been observed chiefly in malignant and chronic visceral diseases, as in those of the liver, pancreas, duodenum, and lungs. The other substances sometimes passed from the bowels, of which no notice need be taken at this place, are described in the article Concretions, *intestinal*, and in the other articles on diseases of the Intestines, &c.—on Worms, &c.

158. (*g*) In all cases in which it is necessary to examine the state of the intestinal evacuations, and indeed in almost every case which comes before the physician, the several regions, not only of the chest, but also of the abdomen, should be carefully examined by percussion, and by pressure, directed according to the peculiarities of individual cases; and the sensations of the patient, as well as the sounds emitted, should be carefully considered. When pain is experienced either previously to, or during, or after evacuations, its character and connexion with defæcation ought to be ascertained. In addition to these points, the strength, nutrition, and vital manifestations of the patient, as well as the performance of the several excreting functions, should receive attention. (See *art.* Abdomen.)

159. IV. Symptoms and Signs connected with the Circulating Systems.—When treating of Auscultation, of the Aorta, of the Arteries, of the Blood, of the Heart, of the Lymphatic and Lacteal System and Glands, of the Pulse, and of the Veins, the Semeiology *of the Circulating Systems* was fully considered, especially as respects diseases of these systems. It therefore only remains for me, at this place, to notice only those topics which have either been omitted or insufficiently discussed under these heads.

160. i. In the articles on Auscultation and Heart and Pericardium, I have described the physical signs of the heart and its capsule. The healthy and morbid sounds of the heart were topics of discussion when these were written, and they still are by no means satisfactorily determined. The interruptions, obstructions, or difficulties to the passage of the blood through the several cavities and orifices of the heart, besides being accompanied by certain physical signs, described under these heads, give rise to several physiological or functional symptoms which ought also to receive due attention. The chief of these are: 1st. Short or difficult breathing, varying from a scarcely appreciable disturbance to dyspnœa or to orthopnœa; and often at first overlooked, or hardly complained of unless when ascending stairs or a height. 2d. Attacks of faintness or of syncope, followed or not by palpitations, &c. 3d. Paroxysms of difficulty of breathing, or startings from sleep, especially about one of the earliest hours in the morning. 4th. A sensation of sinking, or of suffocation, or of dissolution, upon walking quickly, or against the wind, or upon any physical exertion. 5th. Congestion of the brain, owing to obstructed return of blood, occasioning vertigo, headache, or apoplexy, palsy, &c., if not prevented by epistaxis. 6th. Congestions of the lungs, often causing hæmoptysis, pulmonary apoplexy, œdema of the lungs, or serous effusions into the thoracic cavities. 7th. Œdema of the lower and upper extremities, and often also of the face, in the morning; or asphyxia by accumulations of mucus in the bronchi. 8th. Lividity of the lips, tongue, gums, fingers, and nails. These cannot, individually, be assigned to certain or determinate organic lesions, but may severally accompany or supervene upon one or more of these lesions. Certain of them may even be present without any structural change of the organ, as shortness or difficulty of breathing may be a symptom of anæmia, or of chlorosis. Faintness or syncope, with or without a feeling of dissolution, is most frequent in passive dilatations of the cavities, or in cases of fatty softening of the parietes, of the heart, with or without ossification of the coronary arteries.

161. *Palpitations*, as well as irregularities, and intermissions of the heart's contractions, &c., attend several organic lesions of the organ, and they may occur independently of any of these, and merely as a consequence of weakness or other disorder of the digestive organs, or of irritation of some viscus with which the heart sympathizes. When palpitations follow mental emotions or sudden shocks they soon subside, or are followed by depression or faintness; or when they are consequent upon hysteria, or irritation or excitement of the sexual organs, the heart's action returns to its normal state. But in cases

of chronic debility, of exhaustion from prolonged discharges, or from over-exertion, or from inanition, or from prolonged anxiety, even independently of any manifest organic lesion, palpitations may frequently return, be alternated with faintness, or with irregularity of action, or even be characterized by such irregularity. In these latter circumstances, organic nervous power is more or less impaired, as respects the heart, especially in cases of faintness with or without any of these states of irregularity; or this power is irregularly distributed or determined, as in cases of nervous palpitation, in most cases of which it is also considerably weakened; the impaired tone of the muscular coats of the digestive canal, also generally present in these cases, admitting of flatulent distentions and fæcal accumulations, and thereby increasing the cardiac disorder. Indeed, the parietes of the heart very often participate in the impaired vigour or tone of the coats of the stomach and bowels, flatulent distention of these impeding or interrupting the return of the blood to the auricles, and thus preventing either the filling or the dilatation of the cavities of the heart. When palpitations, attacks of faintness, or irregularity or intermission of the heart's action take place without being attended by any auscultatory sign, impaired influence or energy of the organic nervous system—constitutional or organic nervous debility is then generally present, although some change of structure, not indicated by the impulse or sounds of the heart, may also be present, as in case of fatty softening, or of impaired nutrition of the parietes of the organ, or of disease of the coronary arteries. When treating of diseases of the Heart, in 1836, I directed attention to fatty degeneration of the substance of the organ (see that *art.* § 224, *et seq.*); but, although this change may be admitted to be a consequence of impaired or morbid nutrition of the organ, often in consequence of ossific or other deposits in the coats of the coronary arteries, yet both softening and impaired nutrition of the muscular structure of the heart may take place without fatty degeneration in any very manifest degree being present. In all such cases, however, faintness, remarkable shortness of breathing, a sense of dissolution on walking fast, or on exertion, are generally observed.

162. ii. Congestion of the Cavities of the Heart may occur, either from general vascular plethora, or from a greater or more rapid return of blood to the right side of the heart than can be sent onward by the ventricle, or from weakness, or dilatation of the parietes of the organ, or from obstruction to the circulation by material or mechanical causes. Either of these pathological conditions may produce this effect, or any two or all of them may exist in the same case, and may even, without any farther appreciable change, either terminate life or place it in imminent jeopardy, the distention of the cavities having been too great to be removed by the impaired or exhausted power of their parietes, or the material obstruction being too great or prolonged to be overcome by the weakened action of these parietes. In cases of this kind the patient experiences, whichever of these pathological states obtain, extreme oppression and a feeling of distention in the cardiac region, with great alarm, choking, dyspnœa, or orthopnœa, and often also with a sense of impending dissolution. The congestion is not limited to the cavities of the heart, but extends to the large vessels, especially to the veins, and the action of the organ is either weak, or irregular, or tumultuous and inefficient. The congestion is evidently connected with over-distention of the cavities, as shown by the increased sphere of dulness on percussion, by pain in the left shoulder or under the shoulder-blade, often extending to the arm. Death may ensue if the congestion be not removed, partially or altogether, either by stimulating or re-enforcing the power and action of the heart, or by diminishing the distending mass of blood by depletion, or by the combination of both. When this event takes place, it may be imputed to some other pathological state than this, as to spasm of the heart, especially when the orifices, valves, and parietes of the heart present no very manifest lesion, the post-mortem changes, or even the last struggles of existence removing the congestion, either wholly or in part, by which life had been extinguished. The slighter states of congestion of the heart are frequently present in *Hysteria*. (See *arts.* Congestion and Heart, *pluries.*)

163. iii. The Symptoms and Signs furnished by the Arterial and Venous Systems.—Little remains to be added to what has already been advanced on this subject in the articles Aorta, Arteries, Pulse, and Veins, to which the reader may be referred. When treating of the *Pulse*, I have pointed out the Semeiology, comprising both the *diagnosis* and *prognosis*, of arterial action. There is generally heard, by means of the stethoscope, a dull weak sound in the tract of the larger arteries, and this sound is variously modified, according to the state of the blood and the thickness and tone of the arterial parietes. If the blood be thin, or watery, or poor in hæmatoglobulin, or if the arteries be thin, and the blood deficient as respects the capacity of the vessels, the sound of the arteries at every systole of the ventricles is clearer and approaches nearer to a bellows or blowing sound. This sound is single, and ceases with the systole of the ventricles. Pressure on the artery develops this sound, which is imputed to the friction of the blood-current or wave against the coats of the artery at each contraction of the ventricle.

164. *A. Morbid arterial sounds* are either *simple* or single or *double.*—*a.* The *simple* or intermitting bellows-sound is observed when tumours press on arteries, in aneurisms, in cartilaginous and ossific deposits in the coats of arteries, and when the circulation is accelerated, especially in chlorotic or anæmied persons, and after large losses of blood. It is generally sibillous in tone or character, varies in strength and loudness, and is isochronous with the termination of the systole of the ventricles.—*b.* The *double* or continuous bellows-sounds are heard chiefly in the carotid and subclavian arteries, but seldom with equal strength in both. Of these two or double sounds, the first is the stronger; and when they are loud or high, they become whizzing, buzzing, rumbling, or piping, or sibillous; but pressure on the artery, the position of the head, &c., produce various modifications of these sounds, which, however, are generally loudest with the systole of the ventricles.

165. *B. The Capillary vessels* of various parts of the surface, especially in febrile, exanthematous and cachectic diseases, furnish indications of some importance as respects vascular action and vital power. Pressure, in cases characterized by

redness or discoloration of parts of the external surface, often, indeed generally, shows the cause, whether this be capillary injection or congestion, or extravasation. If the last, pressure does not materially affect the discoloration. In the first and second of these causes, pressure momentarily removes the discoloration; and the rapidity of the return of blood into the emptied capillaries is an indication of the rapidity of the circulation. When the colour is florid, the circulation is active, and vital power is not very manifestly impaired, but when it is dark red, purplish, or livid, the capillary congestion is the consequence of impaired vital power, and the circulation through the capillaries is sluggish or impeded. The capillaries become impaired more and more in vital tone with the advance of age, and are subject to the same structural changes as are described when treating of these changes in the coats of the Arteries (§ 38, *et seq.*). When treating of these changes (in 1831), I described the *atheromatous* matter deposited in the walls of the arteries as "a suety substance which is greasy to the touch;" and, although much more recently stated to consist of fat, or to be fatty, yet I believe that the description I have there given (see Arteries, § 59) to be the more correct, as with fat other chemical constituents and animal products are conjoined.

166. *C.* The *veins* furnish indications of pathological states by their size and distention, by their varicose conditions, by the rapidity of their distention when pressure is applied in their course to the heart, and by their pulsations. The veins in the temples, face, and neck are distended in cases of congestion of, and vascular determination to, the brain; and when this state is viewed in connexion with other symptoms, the distention not being caused by attendant convulsions, then vascular depletion is generally required. A distended or varicose state of the veins in any of the extremities evinces obstruction of the venous trunk or large branches, owing either to obliteration, pressure, or other changes described in the article Veins. The rapidity with which the veins refill, after having been emptied by friction, followed by pressure in their courses, as well as their size and fulness, serves to show the degree of fulness, or of deficiency, of blood in the system. The veins are small in youth and in corpulent persons; they are large in the aged and in the emaciated, this state admitting and showing fulness or enlargement of the veins, especially of the extremities. In the aged the veins lose their tonicity, and are more prone to congestion, and to retarded or obstructed circulation, especially when the circulation has to overcome the gravity of the column of blood in the veins.

167. A venous pulse is sometimes seen. It occasionally results from the continuation of the heart's action through the capillaries to the veins, when this action is inordinately excited, and is owing in some respects to the reaction of the capillaries upon the distention caused by the contraction of the ventricle, impelling the blood-wave onward. The pulsation in other cases may be caused by an artery lying under or near a vein; and in some instances the pulsation is retrograde, as in the jugular veins, and in these it is a most important sign of cardiac disease, and is produced by contraction of the right ventricle, and regurgitation of blood, owing to dilatation of the right ventriculo-auricular orifice, or to imperfection of its valve.

168. *D. The blood itself* furnishes most important signs of the nature and probable issue of disease. Of the signs which this fluid—vital in its relation with the several viscera, but more especially with the ganglia and ganglial nerves which supply the vascular systems—presents in disease, particular notice has been taken when treating of the several forms and complications of disease, in the articles specially devoted to them, as well as in the comprehensive article on *the changes observed in the blood in disease*. (See *art.* Blood.) To these, but more especially to this last, I must refer the reader, as nothing of any interest or of the least importance has been added to our knowledge beyond what may be found under those heads, and more particularly the last. *Spontaneous discharges* of blood, and the sources and appearances of the blood thus discharged, furnish very important pathological and prognostic indications, but these are fully considered in the article on Hæmorrhage.

169. iv. The Lymphatic System—*Vessels and Glands.*—This system furnishes but few signs of disease beyond those which appertain to the maladies occasionally seated in them; and these signs are described in the articles on the Lymphatics and Glands, Scrofula and Pestilence, Glandular. Enlargements, inflammations, &c., of the lymphatic glands, and inflammation of the lymphatics themselves, are generally produced by some irritation, sore, or puncture, or by the inoculation of some poison in a situation near to, or beyond the seats of these affections. Enlargement of the glands near the base of the cranium, or in the upper region of the neck, is often observed in cases of scrofulous or tubercular meningitis and softening of the brain, in young subjects, either with or without effusion of serum in the ventricles, or between the membranes; and similar affections of the glands, either near the sternum, the clavicles, or armpits, not unfrequently precede or accompany the development of tubercles in the lungs. Enlargement, inflammation, suppuration, &c., of the glands, and even inflammation of the lymphatics, followed by disease of the glands, are very frequently occasioned by the application or inoculation of some virus or poison, or by sores or irritation, as often shown by the introduction of the syphilitic poison into the frame, and by poisoned wounds or punctures. But independently of these causes and sources of contamination, the lymphatic glands are sometimes enlarged or congested in weak and delicate subjects, and they are occasionally asthenically inflamed and disorganized in the course of pestilential and malignant fever; but most frequently and especially in the plague, in which pestilence the affection of these glands constitutes a distinguishing feature.

170. v. Symptoms and Signs of the Respiratory Function.—These symptoms are of the greatest importance in respect not only of the diseases seated in the organs of respiration, but also of all other maladies to which the frame is liable. More or less disturbance of the respiratory function very often attends diseases of the heart and large vessels, and the advanced stages especially of diseases of the abdominal viscera, of febrile and constitutional maladies, and of affections of the brain. When treating of Auscultation, of the Chest, of the Bronchi, Lar-

YNX, and LUNGS, the signs and symptoms of the function of respiration, were described with reference chiefly to diseases implicating that function. Besides the signs furnished by auscultation, percussion, and inspection and admeasurement of the chest, several other means have been recently suggested of furnishing signs of pulmonary disease, and these have reference chiefly to the determination of the quantity of air received and discharged from the lungs at each inspiration and expiration, and of the power with which these respiratory acts are performed. For this purpose, Dr. HUTCHINSON has invented an apparatus which he has termed a *spirometer;* and in order to show the movements of the chest in health and disease, Dr. SIBSON has furnished an instrument, which is called a *chest measurer*. My limits prevent me from describing these, and their application to the diagnosis of pulmonary maladies, and oblige me to refer the reader for all that should be known respecting them to the *Transactions of the Medical and Chirurgical Society* (vols. xxix., p. 137, and xxxi., p. 353). These means of diagnosis are of more or less service, especially in doubtful or difficult cases; but they should not be confided in farther than that they are useful aids to the means previously employed, and to the rational symptoms furnished by the maladies of the respiratory organs. In all diseases, whether of these or of other organs, the *voice* and *breathing* of the patient demand the strictest attention. The VOICE is especially considered in a separate article; the *respiration* or breathing will be briefly noticed at this place.

171. i. RESPIRATION is influenced or modified by age, by sex, by temperament, by the habit of body, by mental emotions, by the states of the atmosphere, by the positions of the body, and by the sleeping and waking states, and most remarkably by disease. Of certain of these little need be said. Temperament influences the respiration chiefly in connexion with the conditions of the atmosphere, and with mental emotions, the nervous, susceptible, and irritable temperaments experiencing a greater frequency of respiration during warm and humid states of the air, and when the mental emotions are more or less excited. Persons of a full habit of body, and the subjects of obesity, respire more frequently, and receive less air into the lungs at each inspiration, than the thin or the more slenderly formed; and the short in stature have a somewhat less capacity of the lungs than the tall. Much, however, depends upon the breadth or width of the chest. A person when standing or sitting breathes more fully and freely than when lying down or reclining upon either side. Hence, in bronchitis, in pneumonia of both lungs, and in cases of effusion into both pleural cavities, the patient cannot lie upon either side, for this position in some measure extinguishes the motions of the side of the chest upon which he lies, and increases the difficulty of respiration. Respiration during sleep depends very much upon the position and upon the habit of body, and upon the state of the stomach.

172. *Respiration during disease* should be examined, 1st. By observing the motions of the chest, and the phenomena attending inspiration and expiration; 2d. By auscultation, or by listening to the sounds produced by respiration in the several regions of the thorax. The *second* of these modes is considered under the head AUSCULTATION, it furnishes chiefly signs of disease of the respiratory organs, or rather those changes of respiration which diseases of these organs produce. The first not merely evinces diseases of the respiratory organs, but also gives more or less information as to the states of the vascular system, of the abdominal viscera, and of the brain. To this *first mode* of examination a brief notice is to be directed. Attention should be paid, 1st. To the frequency and quickness of the respirations; 2d. To the motions and degrees of expansion in the several regions; 3d. To the states of the nostrils and mouth during respiration; 4th. To the uniformity, the ease, or the exertion of respiration; and the relations, in frequency and exertion, of the individual respirations to each other; 5th. The states of expiration in relation to inspiration; 6th. The sensations experienced by the patient during the acts of inspiration and expiration; 7th. The states of the expired air, chiefly in respect to temperature and odour.

173. *a.* The *frequency* and *quickness* of breathing may each exist independently of the other. Respiration is more *frequent* than in health, when a portion of the lungs can no longer perform its functions, as in pneumonia, tubercular consumption, &c., or when the lungs are more generally affected, as in bronchitis, or prevented from expanding by pleural effusions, by incurvations of the spine, or by the invasion of the thorax by abdominal or other tumours, or effusions, &c. It is also more frequent when the circulation is more rapid than in health, and passes more rapidly, or in larger quantity, through the lungs, as in febrile maladies, and when the lungs are congested by impeded circulation through the heart. The prognosis of increased frequency of breathing depends upon these causes—upon the nature of the one producing it. In febrile diseases, the less frequent the respiration relatively to the amount of fever, the more favourable is the prognosis. The breathing, even in the most unfavourable circumstances, rarely amounts to sixty in a minute. Respiration may be more *rare* or *less frequent* than in health, as when the heart's action is impeded or rendered slow, or when the brain is congested, or the basilar parts of the brain, or medulla oblongata, or cervical portion of the spinal cord, is congested or pressed upon, or in syncope, catalepsy, structural changes of the substance of the heart; in sopor, coma, or apoplexy, or in certain states of paralysis; and during the extreme exhaustion preceding dissolution.

174. *Quickness* of respiration, especially of inspiration, arises from a more rapid action of the muscles of respiration occasioned by either weakness or fatigue of those muscles consequent on paroxysms of cough, as in pneumonia, bronchitis, pertussis, or on great muscular exertions, or on pleural effusions; and in many of these cases, as in pleuritis, in pleuro-pneumonia, in pericarditis, &c., the breathing may be quick and yet less frequent than natural, especially when respiration is attended by pain. Quickness increases the danger of frequency of respiration, especially in pneumonia, pleurisy, tubercular, and other organic maladies. *Slowness* of breathing is very often an attendant of diminished frequency, especially in those maladies with which this latter is mentioned in connexion. When it occurs in

cases of extreme exhaustion, or at a far advanced stage of acute or chronic disease, with a small, weak, or irregular pulse, sinking of the features, cold or clammy extremities, &c., it indicates approaching dissolution. But it may also occur, although not as a consequence of serious disease, as in these circumstances, in cases of nervous debility, during attacks of faintness, or it may usher in hysterical syncope or catalepsy, and be unattended by any danger.

175. *b.* The *motions* and degree of *expansion* of the chest vary much in different individuals in the same disease. The *motions* of the chest, in the several thoracic regions, should be observed when the clothes are removed; and any difference in the degree or extent, or quickness of motion in either side, ought to be noted. Uniformity of the motions of both sides of the chest is an indication of more or less uniformity of the states of the parts contained in each. But if this uniformity is only partial, if it be absent in any region, pleuro-pneumonia, tubercular formations, pleuritic effusions or adhesions, or other structural lesions, may be inferred to exist in the region where the motion is impaired or deficient, and the prognosis is unfavourable, or should be given with much caution.

176. According to the degree of expansion of the chest, respiration is *large*, or *full*, or *small*, or very small or shallow. If the breathing be full or large, the chest expanding freely and naturally, the rhythm being equal or normal, a favourable opinion may so far be entertained; but if this state of respiration be also rare or slow, or if the rhythm be unequal, oppression or congestion of the brain, as in nervous fevers, or sopor or coma, or apoplexy should be apprehended, if not actually present; or the accession of convulsions may be expected, especially in children. Respiration may be very great or large, and yet the quantity of air received into the lungs may be very small, the lungs being obstructed by disease of the bronchi or of their substance, or by emphysema or pleural effusions. A *small* or shallow respiration accompanies pleuritis, pleuro-pneumonia, pericarditis, hepatitis, and diaphragmitis, also peritonitis, gastritis and enteritis, owing to the increased pain or uneasiness occasioned by a fuller or larger expansion of the chest; and is an unfavourable sign especially when it is attended by much debility or a sense of sinking, or by some degree of quickness, or by a sudden stop.

177. If the rhythm, or intervals between the respirations, be irregular or of unequal duration, an unfavourable opinion may be entertained, in those diseases affecting the thoracic organs and brain, and in the far advanced period of other severe diseases, more especially if, with irregularity of rhythm, there also be inequality of the fulness, greatness, and quickness of the respiration, a great respiration following, or alternating with a small one. When the respirations are affected by spasms or by sighing, they are exceptions to this rule. A quick respiration, or a small one suddenly cut short, or interrupted by pain, or by the increase of it, is characteristic of pleuritis, pleuro-pneumonia, diaphragmitis, peritonitis, gastritis, &c.

178. *c. The states of the nostrils and mouth* during respiration often indicate the issue at far advanced stages of the disease. The expansion of the nostrils or alæ nasi at each inspiration indicates a great want of pure air in the lungs, and evinces great danger in all diseases of the pulmonary apparatus. The patient often breathes entirely by the mouth in diseases of debility or exhaustion, or at an advanced stage of acute maladies, especially in dangerous diseases of the brain, and the low or typhoid forms of fever, the tongue and mouth becoming more parched by the passage of air. During respiration various morbid sounds are produced, chiefly by the posterior nares, and by the larynx and pharynx, which possess some prognostic significance. *Snoring* occurs during the sleep of plethoric, or other persons even in health, when the mouth is partially open, and occasionally in disease, especially in apoplexy. A *stertorous* breathing is always morbid, and is of much more importance than snoring, which is generally produced by inspiration, stertor chiefly by expiration through the nose, and is a dangerous symptom in apoplexy. Expiration entirely by the mouth, with a puffing or blowing sound, is still more dangerous in this malady.

179. *d. The Ease, Uniformity, and Degree of Exertion required in Respiration.*—Respiration, as respects the exertion made in its performance, may be easy, weak, strong, difficult, or strangulating.—(*a*) An *easy, quiet*, and regular or uniform respiration, without sighing or cough, is always a favourable sign, especially in febrile affections, and always renders other symptoms, which might otherwise be considered severe, less unfavourable, especially quickness of pulse and heat of skin.—(*b*) A *weak* respiration is characterized by the slightness of the motion of the respiratory apparatus, and by the diminished action of the respiratory muscles. It is a fatal symptom in pulmonary maladies, and in low or nervous fevers. It is chiefly in syncope or faintness, and in catalepsy, in which it is commonly the most remarkable, that it is of the least prognostic importance.—(*c*) A *full* respiration is generally present in healthy persons during exercise, or in excited states of nervous power and of the circulation. It is present, in varying grades, in all febrile and inflammatory affections, or in disorders of excitement unattended by diseases of the respiratory organs, and it does not indicate danger, when it is uniform, easy, and without pain or difficulty.—(*d*) A *strong* respiration is a higher grade of the last, and always is attended by some degree of exertion. It occurs in affections of the trachea and bronchi, in congestive pneumonia, in several diseases of the heart, and in the more sthenic states of fever.

180. *e. Difficult respiration—Dyspnœa*—is attended by much more muscular exertion than the former, and is present in asthma, in bronchitis and pneumonia of both lungs, in effusion into the pleural cavities, in obstructive and congestive diseases of the heart and large vessels, in emphysema of the lungs, &c. In this state of breathing, certain modifications may be remarked depending upon the seat and severity of the malady. 1st. The respiration may be *abdominal*, owing to increased action of the diaphragm, and to the consequent motions of the abdomen. This is observed in apoplexy, in certain states and forms of fever, attended by cerebral congestion and exhaustion, in pleuritis, fracture of the ribs. 2d. The breathing may be *thoracic*, the abdomen presenting but little motion; as in inflammation of the liver, or stomach, or bowels, or of the peritoneum—of the last especially; or in ascites, or en-

largement of the spleen or liver; or other changes impeding or preventing the free action of the diaphragm may be present. If the breathing be both thoracic and abdominal, great difficulty of, or obstruction to, respiration manifestly exists in the organs contained in the thorax, or in the respiratory passages. 3d. According as certain muscles are called into action during breathing, the degree of difficulty may be determined and the severity and danger of the malady inferred.

181. The more that the action of the upper ribs co-operates in enlarging the thorax—the more high the thoracic movements are observed—the *respiratio sublimis*—the more difficult is the breathing, and the more dangerous is the malady, as in hydrothorax, the advanced states of diseases of the heart and pericardium, in bronchitis of both lungs with mucous accumulations, in congestive pneumonia, in tracheitis, &c. In the more extreme cases of this kind, but chiefly in croup, laryngitis, œdema of the glottis, &c., the muscles of the neck are also brought into action, and the muscles also of the face are often also sympathetically affected. In the maladies just now mentioned, the motions of the thyroid cartilage upward and downward with each forced expiration and inspiration are extensive and remarkable. When the motions extend to the mouth and nostrils in difficult respiration, the danger is extreme. The act of inspiration is most difficult, from its commencement, in the several states of croup, laryngitis, inflammation of the epiglottis, in laryngismus stridulus, and in all affections of the glottis: it is most difficult towards the termination when the disease is seated within the thoracic cavity. In some cases of difficult respiration, the patient can take a deep and full inspiration, and yet he breathes with difficulty and frequently. In these the heart or brain, or some other organ, but not the lungs, is affected. In bronchitis, in tubercular consumption, in asthma, and in emphysema of the lungs, expiration is often more difficult than inspiration.

182. In the acute diseases of the thoracic organs, the degree of dyspnœa is not always proportionate to the severity of the attack, or to the amount of organic change. But in all acute cases, a laboured respiration is always unfavourable, especially when it is continued. And in chronic affections of these organs, a gradually increasing dyspnœa, without remission, is even still more unfavourable. Dyspnœa is always greatest when both lungs are affected; and when it is consequent upon the retrocession or disappearance of acute eruptions, especially in the exanthemata, it is always a dangerous sign. If the dyspnœa be attended by profound debility, or lividity of the lips, or gums, fingers, &c., death is near.

183. *f. The sensations experienced during respiration* are most important. These are chiefly pain, anxiety, a sense of strangulation or suffocation, and a feeling of impending dissolution. *Pain* is felt, chiefly during inspiration and towards the close of the act, in pneumonia, in pleuro-pneumonia, in pleuritis, &c., and at the commencement of the act in pleurodynia, acute pleurisy, peritonitis, &c. If it be experienced only when taking a full respiration, adhesions of the lungs to the costal pleura are probably present; but inflammatory action may, in those cases, exist in the lungs, or even in other organs, according to the seat of pain, when thus excited. In bronchitis, bronchial catarrhs, and influenza, the pain is often felt most, at the advanced stage, or towards the termination, of the act of expiration. *Pain* in one or other of the regions of the chest may be constant, but more or less aggravated during respiration, or it may be experienced only during this act, or not be felt unless the inspiration or expiration be full and deep. Pains about or below the collar-bones, shoulders, shoulder-blades, in the back, or between the shoulders, are frequent in tubercular consumption, and may exist independently of inspiration, although often increased by it. When thus increased and experienced towards either side of the sternum or towards the angles of the ribs, or even in the back, chronic adhesions exist, or are being formed, between a portion of lung and the ribs. Pain in the sternum, not aggravated by full respiration, is often syphilitic; if aggravated or caused by respiration, especially expiration, it is produced by bronchitis, or inflammation of the mediastinum. Pain in the cardiac region, if it be continued, but aggravated by breathing fully, or if it extends to the left shoulder and arm, may depend upon carditis, pericarditis, or endocarditis, more especially if rheumatism of some joint or part have preceded it, or accompany it. If the pain continue in the same part, it indicates acute or chronic inflammation of the subjacent structures. If the pain shift about, it may be owing to hepatic congestion, or to some other biliary disorder, or to rheumatism or pleurodynia. Pain in the right shoulder, and under the right shoulder-blade, is generally caused by disease of the liver. When pain is increased by pressure, it may be attributed to pleurodynia, or pleuritis, or to pericarditis. The motions of the arm and chest increase the pain of pleurodynia. A dull pain, a feeling of weight or oppression, or tension, attends pneumonia, congestion of the lungs or heart, dropsy of the thoracic cavities, and enlargements of the liver or spleen, especially when great, and in certain positions of the body. Intensity of pain is seldom proportionate to the severity of the disease of the thoracic viscera. It is generally greatest or most acute when the attack is sudden, extensive, and seated chiefly in the serous tissues. In most cases, when the pain is increased, or is induced, by full respiration, there is more or less anxiety.

184. *g. Anxious* respiration is most frequent during congestive states of the lungs, heart, large blood-vessels, and brain; but more especially in diaphragmitis, pleuritis, in disease of the valves or orifices of the heart, in fatty softening of the substance of this organ, and towards the fatal termination of inflammations of the lungs, bronchi or pleura, and of thoracic dropsy. It is always an unfavourable symptom. A *strangulating* or suffocative respiration occurs chiefly in croup, laryngitis, and other affections of the larynx or trachea. Respiration may be attended by a feeling of impending *dissolution*, especially when it is frequent, short, and difficult, especially in angina pectoris, in the organic lesions of the heart, &c., in some cases of spinal paralysis, in all of which it is a very unfavourable symptom. If the feeling be caused by the accession of syncope, the prognosis is very different, unless the syncope proceed from disease of the heart.

185. *h. Other phenomena* are presented by the breathing that deserve notice. When the respiration is healthy, it is not attended by any sound which can be heard by the ear when removed

from the chest; but in cases of difficulty, especially in the states now described, various modifications of *sound* may be heard. The sounds of inspirations and expirations become audible, and even somewhat loud, during or after physical exertion, especially ascending eminences, and at the same time frequent, strong, and deep. Respiration is *suspirious* or sighing, during states of mental anxiety and depression, of pulmonary, and of cardiac congestion, in cases of nervous depression or exhaustion, in hysteria and in hypochondriasis, and in hepatic or biliary congestion. Recovery from faintings, syncope, hysterical paroxysms, and from catalepsy, is attended by suspirious breathing. A *panting* or *gasping* respiration is observed chiefly in the most extreme or dangerous cases of thoracic disease, and in the same circumstances as have been noticed in connexion with the most difficult states of respiration, of which this is the most fatal. It often terminates life in cases of pneumonia or of bronchitis, or of congestion of both lungs, in the advanced states of organic disease of the heart, of hydrothorax and hydro-pericarditis, and in diseases of the larynx and trachea. In these last, in asthma, in œdema of the glottis, and in hysterical affections of the throat and neck, the breathing is often also suffocative or strangulating, and attended by a *sibillous* or *hissing* sound. In the spasmodic states of the larynx, as in laryngismus stridulus and hooping-cough, the sound is *crowing*, *loud*, and *stridulous* at each inspiration, ultimately ceasing in a short time, or becoming strangulating and suffocative, and terminating life with the usual phenomena of asphyxia. As to the sounds of respiration in the several regions of the chest, on Auscultation, I must refer the reader to that head.

186. *i. States of the expired Air in respect of Temperature and Odour.—A.* The *temperature* of the expired air is always more or less above natural in sthenic inflammations of the lungs, bronchi, and pleura, during inflammatory fevers, and in the state of vascular excitement in continued and periodic fevers. It is slightly lower than in health in states of vital depression, especially in congestive affections of the thoracic organs, and in disorders of debility; and it is much lower in the last or the advanced periods of fevers, particularly the adynamic, the typhoid, and the malignant, and in the asthenic forms of the exanthemata. It is lower still, being almost cold and raw, in the choleric pestilence, and in the extreme or fatal states of congestion, when the changes produced by the air on the blood cease, or nearly cease to take place.

187. *B.* The *odour* of the breath varies much. In perfect health it is sweet or pleasant; but during disorders of the digestive organs, it is foul, loaded, or unpleasant. It is more or less unpleasant, in cases of dyspepsia, during flatulence and costiveness, and during the catamenia, when the odour is peculiar. It may be rendered very unpleasant by several articles even during health, as by eating onions, leeks, asafœtida, garlic, &c. The odour of the breath of those attacked by continued, exanthematous, malignant, and pestilential fevers is most unpleasant and infectious, especially to the predisposed. In those the odour is particularly disagreeable, and the humidity of the expired air is often unusually great, and loaded with animal matter, especially at an advanced period of these maladies, as shown by breathing on a mirror or on any cold polished surface.

188. A disagreeable odour of the breath is present also in scurvy; in cancerous diseases of the stomach, mouth, uterus, &c.; in malignant sore throat; in gangrene of the lungs; in constipation of the bowels, and frequently in diarrhœa, especially in the diarrhœa precursory of pestilential cholera, and in asthenic dysentery. In this last and in chronic diarrhœa, an earthy or cadaverous odour of the breath is a most dangerous sign. In verminous complaints and in chlorosis the odour is sweetish, or resembles that of new milk. There are several other topics connected with respiration, but certain of them have received a special notice under their respective heads, as Cough, Hiccough, Voice and Speech, and to those the reader is referred. It therefore only remains to consider at this place the *expectoration* and the *signs connected with expectorating*.

189. ii. The Expectoration furnishes much information as to the nature, seat, and issue of disease, especially of pulmonary diseases. It may consist, 1st, of morbid mucus; 2d, of purulent mucus; 3d, of purulent mucus containing portions of tubercular matter; 4th, of pus or ichorous matter; 5th, of blood, or blood conjoined with either of the preceding; 6th, of fibrinous substances moulded in the bronchi; and, 7th, of calcareous matter, or hard concretions formed in, or the remains of tubercular deposits. In order to form a correct idea of the various matters thrown off the respiratory passages, the appearance and composition of healthy mucus from these passages should be noticed. There is, however, much difficulty in obtaining healthy mucus from these sources, as it is more or less altered from the normal state when excreted in such quantity as admits of its examination, and it is so mixed with the secretion of the bronchial glands, and so changed by the air, and the states of the air in certain localities, as to modify its condition very remarkably. The mucus of the bronchi is propelled along these canals by the ciliary motion on the surface of the mucous membrane, and by the respiratory functions. The mucus excreted is a viscid, tough, and tenacious or stringy matter, which is often clear or colourless, but more frequently it is turbid, of a grayish, or faint yellowish white tint, and of semi-fluid consistence. According to Simon, it consists, chemically, of a varying proportion of water and of the following constituents—namely, mucus-corpuscles, epithelium-cells, mucin, small quantities of extractive matters and fat, chlorides of potassium and sodium, alkaline lactates, a little carbonate of soda and phosphate of lime, and sometimes a minute quantity of albumen.

190. *A. Morbid mucus* is produced chiefly by catarrh, bronchorrhœa, and by bronchitis; and in these especially, as well as in several other diseases, it is often produced in great quantity, and in various states. The quantity, as well as the appearances, of the pulmonary sputa depends much upon the quantity of water or serum, and of albumen, with the other ingredients just mentioned. The sputa are most watery or serous in bronchorrhœa, and in congestive and œdematous affections of the lungs: they are most viscid and albuminous in the inflammatory states of the bronchi. In these states the sputa are whitish, or of a pale yellow colour, and float in water. They possess a certain degree of consistency, and

feel slimy in consequence of the mucin connecting the mucus-corpuscles.

191. *B. Purulent mucus* from the lungs contains much less mucin than normal and morbid mucus; and consequently, the sputa have not the toughness, lubricity, and consistence of mucus unmixed with pus, and have a decided tendency to dissolve. In bronchitis and other affections of the lungs, the transition from morbid mucus to purulent mucus is so slight, that it is hardly possible to detect the first traces of pus mingled with the mucus—or to determine the presence of a little pus in mucus, or of a little mucus in pus Purulent mucus sinks more quickly in water than the healthy secretion, owing partly to its containing less air, and partly owing to the greater quantity of albumen and of chlorides and higher specific gravity. Equal proportions of mucus and pus readily sink in water. A small amount of pus separates from the mucus when placed in water. Phthisical sputa, which commonly consist of purulent mucus, deposit a whitish granular sediment at the bottom of the vessel, while masses of mucus are still floating on the surface of the water.

192. *C. Purulent mucus with softened tubercular matter* is observed in the second and third stages of phthisis. Most of the expectoration in the malady proceeds from the chronic bronchitis which accompanies it. When the sputa are placed in a glass vessel containing water, then minute portions of softened tubercle, or much larger fragments, may be detected either adhering to the mucus or sunk to the bottom of the vessel, with the granular sediment consisting chiefly of the purulent portion of the excretion. These fragments of softened tubercle consist either of whitish streaks, or yellowish white masses, resembling portions of boiled rice, or of greenish white matters, of irregular shapes. (See *art.* Tubercular Consumption.)

193. *D. Pus and Ichorous Matter.—a.* Pus may proceed from three sources: 1st, from violent inflammatory irritation of the bronchi; 2d, from inflammation of the parenchyma of the lungs; or, 3d, from a vomica or abscess opening into the bronchi. This last is comparatively rare, and pure pus is very seldom produced by the first and second sources. Violent irritation of the respiratory passages may cause the formation of pus in place of the mucous secretion. Hence the production of pus is owing to a greater intensity of the same morbid action which, in progressive grades, produced morbid mucus and purulent mucus; but it may be assumed that even in this highest grade a small proportion of mucus may still be present. Genuine pus is a somewhat thick fluid, viscid, but capable of separating in drops, like cream, of a whitish yellow, yellow, or greenish yellow colour, and of a faint animal odour. It may be slightly acid, or slightly alkaline, or even neutral. When mixed with water it soon sinks to the bottom, and on stirring it forms an emulsive fluid from which a sediment of pus-corpuscles is soon deposited. When examined under the microscope, pus appears, like mucus, to consist of a clear fluid in which small, round, and occasionally oval corpuscles are swimming, the quantity of which is in a ratio with the thickness of the pus. Pus and mucus corpuscles closely resemble each other in form and chemical relations. Their sizes are nearly the same; but the nuclei of the former become more distinct than those of the latter when the corpuscles are treated with acetic acid.

194. The *liquor puris*, or fluid in which the corpuscles are contained, is transparent, and usually of a pale yellow colour. It contains so large an amount of albumen, that on the application of heat it becomes white, and very flocculent. The large amount of albumen, and of the chlorides. especially the chloride of sodium, associated with a small quantity of fat, distinguishes the fluid portion of pus from the consistent and adhesive fluid of mucus, and indicates the affinity between the liquor puris and lymph. The fat is chiefly contained in the pus-corpuscles, the nuclei probably containing a large proportion of it. In the liquor puris the fat is combined with alkalies.

195. It appears from the researches of Gruby, Simon, and others, that pus consists of two distinct portions: 1st. A fluid, or liquor puris; 2d. And of corpuscles swimming in this fluid, and insoluble in it. The corpuscles are surrounded by a capsule which becomes tumid in water, is soluble in free potash, and is reduced by ammonia to a thick viscid jelly, dissolves on prolonged gentle digestion, and is doubtless composed of mucin. Of the nature of the contents of the corpuscles lying between the nucleus and the capsule nothing is known. The nucleus probably consists of albuminous matter and fat. The liquor puris contains much albumen, some fat, pyin or dissolved mucin, extractive matter and salts. In pneumonia, as the chlorides, especially the chloride of sodium, are increased in the sputa, they are diminished, or disappear in the urine.

196. An *ichorous matter* is sometimes expectorated when gangrene of a portion of the lung takes place, and in malignant growths in the lungs. It may either proceed from a decay or other change of pus, or be secreted from the gangrenous or malignant part. This matter is thin, discoloured, of a brownish or reddish tint, and emits a fetid odour. It often either contains no pus globules, or very few, and those are broken down. Although ichor is of a reddish colour, it may not contain blood-corpuscles, these corpuscles having been dissolved in the morbid fluid, and having thereby imparted this colour to it. Mucus, or muco-puriform matter, may be expectorated with it in greater or less proportion, owing to the irritation of the bronchial membrane over which it passes during the process of its excretion. The presence of this matter is always indicative of great danger. Recovery may, however, take place when it proceeds from gangrene of a small or isolated portion of the lung.

197. *E.* Blood may be present in any of the states of the sputa already described. It may form, in a pure and unmixed state, the whole or the chief amount of the expectorated matter, or accompany more or less of either of the preceding kinds. It may merely streak or dot the sputum, or be so intimately mixed with it as to give it a pinkish, reddish, rusty, or brownish hue. When the blood is at all considerable, it proceeds from one or other of the sources described when treating of Hæmorrhage from the respiratory organs: it may be caused by interrupted circulation through the heart, or by congestion of this organ, or by congestion of the lungs and bronchi, with or without congestion of the heart, or by the irritation or congestion produced by tubercles, or by inflammatory action, or by the ulceration or erosion of vessels in tubercular cavities, or by

disease of the coats of the capillaries or arterial ramifications. It was the fashion, formerly, to ascribe all hæmorrhages from mucous or villous surfaces to an exudation from the capillaries of these surfaces; but this, although a common source, especially when congestion or inflammatory irritation exists, does not always or even generally obtain, for ulceration or erosion of vessels, and disease of their coats, especially suetty or atheromatous deposits in them, favouring their rupture when congested, are not infrequent sources of hæmorrhage, especially when the discharge of blood is large or very considerable. When the bloody expectoration is small in quantity, it commonly proceeds from exudation, owing either to congestion and relaxation of the capillaries, and then it is rusty or dark-coloured, as in congestive or asthenic pneumonia, or to inflammatory irritation of the bronchi adjoining the inflamed portion of lung, and then the blood is of a more florid red, in very small quantities, and mixed with a muco-purulent matter, as in sthenic pneumonia and in tubercular consumption.

198. When blood has been expectorated in either large or small quantities, it often continues to colour the sputa for several days afterward, the colour generally passing from a dark red to a brown, or rusty, to an ochrey and greenish hue, as the quantity of colouring globules diminishes or becomes altered in the containing fluid. Extravasated blood always occasions more or less irritation in the mucous surfaces over which it passes, and hence a more copious expectoration of morbid mucus or of muco-purulent matter follows the hæmorrhage, and continues for a longer or shorter period, according to the nature of the primary and consecutive changes. When blood is present in the expectoration in a quantity merely sufficient to colour the expectoration, and is intimately mixed with it, pneumonia is certainly present, the variation of the tint from red to brown, or from a reddish brown to that of prune juice, indicating the failure of vital power. If the blood merely appears in minute streaks or spots, severe catarrh or bronchitis may only exist; but if it occur in larger spots or patches, pneumonia or phthisis is commonly present. When the spots of blood are found in a copious turbid or muco-purulent expectoration, then phthisis or very severe bronchitis exists. When they are seen in thick yellowish or greenish-yellow and rounded sputa, then pneumonia may be inferred: in these cases the prognosis is very unfavourable. A frothy, fluid, and bright red blood is usually an exudation from the bronchial membrane in phthisis. Dark-coloured blood, without froth, and without muco-purulent expectoration, and in large or considerable quantity, proceeds generally from congestion, or from erosion of vessels in a tubercular cavity, or from pulmonary apoplexy. Clear fluid blood, without froth, and in large quantity, comes either from aneurisms, or from eroded or diseased vessels.

199. The bleeding may proceed from the pharynx, or even from the posterior nares, and, owing to the irritation produced by it in the glottis or epiglottis, occasion a hawking cough; but in these cases, redness is generally observed in the throat. The bleeding may be vicarious of menstruation or of hæmorrhoids, or be consequent upon the suppression of either; and if in these cases there have been no antecedent symptoms of phthisis, the blood may proceed chiefly from the bronchial surface; but even in these it is often followed by, or connected with, either bronchitis or tubercular deposits. When the bloody sputa occur in fevers, and in the course of cardiac disease, the prognosis should be very unfavourable: it may be less so when bloody sputa are observed in scurvy and purpura. In all these cases numerous concomitant and antecedent circumstances should be taken into consideration.

200. *F.* Fibrinous Exudations take place, in rare cases, in chronic and in sub-acute states of bronchitis, and are moulded in the ramifications of the bronchi. They are generally expectorated in the form of the bronchial tubes, and present various extents of ramification and degrees of firmness and tenacity. These ramifications are very rarely hollow: they are commonly either filled with a softer matter, or are firmer in the more external layer. They resemble the false membranes or fibrinous exudations formed in the larynx and trachea in croup; and which are frequently thrown off in that disease accompanied with more or less gelatinous or glutinous mucus. (See *art.* Bronchi, § 49, and Croup, § 33.)

201. *G.* Earthy or Calcareous Concretions are sometimes expectorated by persons who have had phthisical symptoms and recovered, or who are still suffering them in a chronic form, or have suffered in various grades for several years. I have seen many of these cases. These concretions vary in size from that of a head of a pin to that of a small bean. Their surfaces are generally unequal, irregular, and ragged. The expectoration of them may or may not be attended by much sputa, which may or may not be coloured with blood: most frequently the sputa are scanty, and are only minutely streaked or dotted with blood. A medical man called upon me, complaining that on each inspiration and expiration, but during the latter especially, there was a loud whistle, which could be heard at any distance in the room from him. He had neither cough nor expectoration, and he stated that he had not experienced either for several years. He was a fluent and eloquent speaker and lecturer, and never experienced any inconvenience from speaking for a long time; but many years ago, he had had some pulmonary symptoms. I told him that one of these concretions, of considerable size, was making its way through the parietes of one of the large bronchi, and that he would expectorate it in the course of a few days. He did so, the concretion being the size of a large pea. He is quite well at this time. A relative of my own has expectorated many of them, at different periods, the largest being the size of a small bean. She has been the subject of chronic phthisis for many years, but is now able to be about and go out of doors.

202. *H.* The Expectoration in the several forms of disease of the Respiratory Organs has been fully described under the separate heads of Catarrh, Cough, Bronchi, the diseases of, Hæmorrhage *from the respiratory organs*, Lungs, the diseases of, Pleura, Tubercular Consumption, &c.; but it will, nevertheless, be useful to give at this place a brief *resumé* of the appearances of the sputum in those maladies in which it is present in increased quantity or altered quality.—(*a*) In *dry catarrh* the sputa are scanty, and consist of small pellets of tough, grayish, or greyish-yellow mucus, which are expectorated

after severe fits of cough.— (*b*) In *pituitous catarrh*, the sputa are much more abundant, and thin or watery, consisting of a serous mucus, containing albumen and mucin. This expectoration varies much in quantity and appearances, with the severity of attack, the congested state of the lungs, and with its complication with rheumatic or cardiac affections.—(*c*) In *bronchorrhœa* the expectoration is watery or serous, most abundant, and sometimes extremely so when complicated with pulmonary congestion or cardiac disease.— (*d*) In *acute bronchitis*, little or no expectoration occurs at first; but a liquid, slightly saltish sputum is soon formed, which gradually increases with the progress of inflammation. It is at first transparent, nearly colourless, moderately viscid, retains many small air bubbles, and is frothy on the surface, especially when expectorated after much coughing. When expectorated in the same vessel, the sputa coalesce, and may be drawn into a ropy stream. The viscidity of the sputa is in proportion to the severity of the inflammation, of the fever, and of the dyspnœa. As the disease declines, the sputa become pearly, opaque, or of a yellowish or greenish white, and more consistent and glutinous. If a relapse or exacerbation takes place, the expectoration becomes thinner, more transparent, glairy, and frothy. As amendment advances, the sputa are more readily coughed up, and in more distinct pellets, which do not so readily unite into one mass as before. They gradually diminish in quantity.—(*e*) In *chronic bronchitis* the sputa vary much in different cases, and in the same case at different periods. They are frequently similar to the sputa at an advanced period of the acute form. They are often opaque, yellowish or greenish-white, owing to an admixture of a muco-purulent matter of this hue with mucus, and a watery or serous fluid. Sometimes the thick, opaque matter floats in the pituitous or serous fluid expectorated with it. In other cases, the mucus is inspissated, fibrinous, and moulded into the shape of the bronchial ramifications (§ 200).

203. (*f*) In *pneumonia*, the sputa, after the first two days, consist of a viscid, transparent fluid, tinged with an orange or rusty hue. At first they resemble the sputa of acute bronchitis, and they may be poured from one vessel into another in the form of viscid strings. At a more advanced stage, the sputa become so glutinous and viscid as not to leave the vessel even when inverted. They are also more streaked with blood, or red, or rusty. As the disease declines, the sputa assume the first or bronchitic appearance. In unfavourable cases, the expectoration becomes more viscous, more rusty, brown, opaque, or purulent. In some still more unfavourable cases it is altogether suppressed, owing to its viscous nature, and the want of power to throw it off; suffocation taking place, with lividity of the prolabia and extremities. In other unfavourable cases, the expectoration assumes the form of a deep, reddish-brown and slightly viscid liquid, like the juice of preserved prunes or liquorice water. This appearance indicates the existence of suppuration, or of a cachectic state of inflammation which has gone on to softening or purulent infiltration. The characteristic sputa of pneumonia, or pleuro-pneumonia, are orange, greenish-yellow, reddish, bright-red, or streaked or dotted with red, or rust-coloured, according to the amount of red globules contained in them.—(*g*) In *pleurisy*, the expectoration is scanty, mucous, or muco-serous, or resembles that in the different forms of catarrh.

204. (*h*) In *phthisis*, the expectoration is varied according to the stages of the disease, and is chiefly from the bronchi during the whole course of the malady, and altogether from them during the first and second stages. In some states of phthisis, little or no expectoration takes place throughout, or not until shortly before death. In the *first* stage there is either no expectoration, the cough being dry, or it is of a simple catarrhal or bronchitic character, or sero-mucous, and more or less abundant, especially when the lungs are thickly studded with tubercles, a mucous rhonchus being generally heard on auscultation. In the *second* stage, the expectoration continues as in the first, or assumes a more bronchitic character, or passes into the muco-purulent form of chronic bronchitis, until the softening and evacuation of the tubercular deposits. When the softened tubercles make their way into the bronchi, the irritation of these canals is increased, the mucous or muco-purulent expectoration is augmented, and contains whitish streaks, or whitish-yellow fragments, consisting of the softened tubercles. As the softening and formation of a cavity proceeds, the sputa assume farther changes, which have been already noticed above (§ 192), or fully described in the article on Tubercular Consumption.

205. (*i*) The sputa are *evacuated* or *expectorated* with various degrees of ease or of difficulty, according to the nature and stage of the disease, the state of the sputa, the age and the strength of the patient. They may be hawked up with much ease, in some cases, or coughed up with more or less difficulty in others. They may be expectorated and swallowed, as in children, and sometimes in adults, when they are not very abundant. The rapid, violent, and loud expiration, by which expectoration is generally effected and cough produced, is caused by irritation existing in, or sympathetically propagated to, the larynx. *Cough* may thus be occasioned either by the irritation of sputa, when they reach the larynx, or sympathetically by disease in any part of the respiratory apparatus, or by disorders of the stomach, œsophagus, or pharynx and fauces. In the former case, expectoration follows the cough; in the latter, there is no sputum, or very little. (See *art.* Cough.) The more viscous the sputum, the more difficult is the cough, especially in bronchitis; the cough often becoming suffocating or even strangulating as the sputum passes the larynx, as in croup, and the bronchitis of old persons, especially at a far-advanced stage. As the strength of the patient sinks, the morbid secretion accumulates, is expectorated with greater difficulty, sometimes becomes more viscous, and hence still more difficult of discharge, the functions of the lungs are impeded, and ultimately arrested.

206. iii. Yawning and Sighing are nearly related phenomena, both consisting of prolonged inspirations, and both indicating nervous weariness or exhaustion; or the depression depending upon mental longings, fatigue, or approaching sleep. They are often present during the more slight states of congestion of the lungs, or heart, or large vessels; and they are generally of service in relieving these states, by accelerating the circulation, and by more fully dilating and supplying

the air-cells with fresh air. They are frequently observed during the premonitory and invading stages of acute or febrile diseases, and in states of nervous exhaustion and general debility. While yawning is most frequently a sign of *ennui*, or of mental vacuity and fatigue, sighing is most commonly a sign of mental depression, melancholia, or hysteria.

207. iv. Sneezing is a reflex, spasmodic action of the respiratory muscles, consequent upon irritation or titillation of the Schneiderian membrane. It consists of a deep inspiration followed by a sudden and violent expiration, by which the air is driven out through the nose and mouth with much force and an audible noise. It is most commonly occasioned by an incipient catarrh; but it may occur from various causes of irritation implicating the nasal and respiratory passages, and as a sympathetic phenomenon in hysteria and in verminous disorders. It sometimes, when frequently repeated, precedes or ushers in an attack of apoplexy or palsy.

208. Of *laughing* and *weeping*, it is unnecessary to remark farther, at this place, than that they are chiefly manifestations of certain opposite states of mental emotion; that they occur chiefly in susceptible, and often weak minds; and that they are characteristic phenomena of the hysterical paroxysm. They are sometimes of use, the latter especially, in moderating the emotions; laughing, by its mechanical stimulus, or its succussions, transmitted to the biliary apparatus; weeping, by proving a serviceable derivation from a congested brain, or an overloaded or congested heart and large vessels.

209. VI. Symptoms and Signs connected with the Urinary and Sexual Organs.—The signs furnished by the urinary and sexual functions and organs are of the greatest importance, as respects not only the diseases of these and of related organs, but also numerous maladies of distant parts and of the whole frame. Those signs which more immediately belong to diseases of these organs are described in the articles upon these diseases, especially in those treating of the Kidney, of Leucorrhœa, of the Ovaria, of the Urine, Urinary Bladder and Passages, of the Uterus and Vagina, and of the Vulva.

210. i. The Signs furnished by the Urinary Excretion.—The signs connected with the urinary functions divide themselves into, 1st, those which are connected with the chemical and physical states of the *urine* itself, and, 2d, those which depend upon the modes of *excreting* the urine. The *first* of these are discussed in the article Urine, and several of both the first and *second* are directly dependent on diseases of the Urinary Organs. Both orders of signs may appertain either to diseases of these organs, or to diseases of the brain or spinal cord, or to maladies implicating the whole frame, as pestilential, malignant, or exanthematous fevers; or to disorders of the digestive, assimilative, the excreting, and the sexual organs. The great interest which thus necessarily attaches itself to states of the urine, and of the excretion of it, will become at once apparent, from the connexions just enumerated. Reserving, however, the chief topics connected with these subjects for the articles just mentioned, I shall merely glance, at this place, to a few of those which are of less importance, and which are signs merely of disorders of distant organs, or of constitutional maladies. Of the states, changes, and chemical conditions of the urine, I have treated at another place (see *art* Urine): I now notice merely changes in the function of excreting it.

211. *A. The excretion of the urine* may become difficult, painful, changed, or arrested; and the *secretion* of it may be scanty, or altogether suppressed, the excretion being similarly affected. Difficult excretion of urine may amount to what has been termed *dysuria*, in a lesser grade, and to *stranguria* in its higher grade: the former requiring much effort to empty the bladder, the latter strong efforts to discharge the urine, and chiefly by drops or small quantities. *Ischuria* has been used to express the suppression or the retention of urine—*ischuria renalis*, when none is secreted, and *ischuria ureterica*, or *vesicalis*, or *urethralis*, according *to* the seat of obstruction.—*a*. Dysury and strangury may proceed, 1st, from diseases of the urinary organs and passages; 2d, from the conditions of the urine itself, or from the presence of a calculus or calculi in the bladder or urinary passages; and, 3d, from disease of either adjoining or distant viscera, as in cases of dysentery, of hepatic or splenic disease, or of uterine or ovarian lesions. Neither dysury nor strangury should be viewed as devoid of risk, whenever observed. If either occur in aged persons, or in those who have previously experienced disease of the urinary organs or passages, a most minute examination should be instituted to ascertain the nature and seat of lesion, from which alone the amount of risk or danger should be inferred.

212. *b. Ischuria* may more correctly be divided into that of *suppression* and that of *retention*. The *suppression* or non-secretion of urine is caused, 1st, by inflammation or structural changes of the kidneys themselves; 2d, by congestions, inflammations, or other alterations occurring in the course of exanthematous or other fevers, or pestilences; 3d, by organic or other maladies of the brain, spinal marrow, or their membranes. In all these circumstances, the ischuria is a most dangerous sign, inasmuch as it consists of the suppression of a function by which the principal part of the injurious, effete, and irritating materials accumulating in the blood is eliminated and discharged; the arrest of the function being necessarily followed by very manifest alterations of the blood, by an uncommon excrementitious plethora, and by effusions in shut cavities and cellular parts, by coma and death, unless restoration of the excretion take place before these results have reached an irremediable extent. The *ischuria suppressionis*, in the three classes of disease in which it occurs, is nearly equally dangerous; as respects the general results, it is least so in inflammation or congestion of the kidneys; it is most dangerous, or commonly fatal, in diseases of the brain and spinal cord, and it is not much less dangerous when it occurs as a complication of exanthematous or other fevers or pestilences. In scarlet fever, the kidneys are often asthenically inflamed or congested to an extent incompatible with the performance of their functions, the excrementitious matters and fluid which should be excreted by them thereby accumulating in the blood. In pestilential cholera, the ischuria is a consequence of the excrementitial fluid of the blood being all discharged by the digestive canal and skin, none being left that can be removed by the kidneys; other excrementitial matters, however, accumulating in the blood, owing to the suppression of the renal function, and consecutive-

ly inducing secondary fever and fatal complications.

213. *c. Ischuria retentionis*—the ischuria of retention, or of obstruction—may take place either in consequence of an obstruction at the outlet of the pelvis of one or both kidneys, or in the course of the ureter, by a calculus, tumour, or any other lesion, or by inflammation, suppuration, &c., implicating either or both these. In all these cases the urine may be secreted, may accumulate in the pelvis of the kidneys or ureters above the seat of obstruction, and none may reach the bladder. But the *ischuria of retention* most frequently occurs in consequence, 1st, of *paralysis* of the coats of the bladder, consequent upon disease or injury of the brain, spinal cord, or their membranes; or of congestion of the nervous centres and paralysis of the bladder, in the course of typhus or low fevers; and, 2d, of *obstruction* to the discharge of urine from the bladder, sometimes caused by spasm, but more frequently by disease near to, or in the neck of, the bladder or urethra, as diseased prostate, impermeable stricture, the impaction of a calculus, &c. In all these circumstances ischuria is attended by more or less danger, but the amount of danger altogether depends upon the exact nature and seat of lesion, in respect of the urinary passages, upon the age and sex of the patient, and the progress and duration of the pathological lesion by which the ischuria is caused.

214. *d.* Ischuria may occur, however, in hysterical females—*Ischuria Hysterica*—and may depend upon either congestion of the spinal cord, and paralysis of the bladder, or upon spasm of the cervix vesicæ; most probably upon the former. Several cases of this form of ischuria have come under my notice, in which the urine required to be drawn off twice or thrice daily, yet complete recovery has ultimately taken place. It is generally caused by masturbation, and is sometimes feigned.

215. *B. Inability to retain the urine—Incontinentia Urinæ—Enuresis*, occurs in various forms. It may follow ischuria, or may take place even in connexion with over-distention of the bladder; the coats of this viscus having been so over-distended as to have lost the power of contraction and of evacuation. In this case, there is a constant dribbling of the urine. In such cases the prognosis is unfavourable, and especially in aged persons. The incontinence may proceed from the state of the urine itself, especially when, owing to disease of the kidneys, it contains either blood or albumen; but this form consists rather of frequent calls to pass urine, the quantity being small, than of absolute incontinence. Very frequent calls to micturate occur in most inflammatory diseases of the urinary organs, and more especially in those affecting the bladder. In such cases, these calls take place as soon as a spoonful accumulates in this receptacle. This incontinence may also proceed from ulceration of the inner surface of the bladder, or from disease of the neck of the viscus, or from calculi, or clots of blood, or from foreign bodies, in the bladder, or from paralysis of the neck of the bladder. The paralytic state is most frequent in aged persons, in those who have previously suffered diseases of the urinary organs, as a consequence of strangury or ischuria, or of disease of the spinal cord or its membranes, and as a complication of typhus or of low fevers; in all which circumstances it is a very dangerous symptom.

216. *C. Frequent calls* to pass urine, more or less being passed on each occasion, sometimes occur in nervous persons, especially during states of mental anxiety or expectation; and in hysterical females. In many instances, the quantity of pale urine passed on one, or on several occasions, in connexion with hysteria, is often surprising. In these, this symptom need not create much anxiety; but in all cases of frequent calls to micturate, especially during night, the urine ought to be tested, in order to ascertain the presence of albumen, or other substances in it. Whenever this complaint occurs, the state of the urinary organs and the habits require attention, and should be ascertained in connexion with the physical state, the quantity, and the chemical condition of the urine itself, and with the functions of the digestive and circulating organs.

217. *D. An external examination of the abdomen* should always follow the recognition of the symptoms and signs connected with the urinary organs and urine. Percussion will aid in ascertaining the existence of enlargement of the kidney, or of distention of the bladder. Increased size of the kidney, or the accumulation of fluid in the pelvis of the organ, may be inferred, when, with marked dulness on percussion, there is also a fulness or tumour felt, while the region between the lower ribs and margin of the ilium is pressed forward, the thumb being gently moved or pressed anteriorly. But the bowels ought to have been freely evacuated before this examination can be confided in. The *sensibility* of the region of the kidney, during this, or any other examination, affords information of great importance in determining the existence of disease of the kidney, especially inflammation and the existence of calculi in the ducts or pelvis of the organ. The ureter may be so distended in ischuria ureterica, or when a calculus is impacted in its lower extremity, as to be felt like a rope in, or closely above the inguinal region.

218. A dull sound on percussion, immediately over the pubis, indicates fulness of the bladder. Pain in this situation is a sign of over-distention; and pain behind or below the pubis is a symptom of inflammation or ulceration of the bladder, or of its cervix, and of stone in the bladder. Disease of the prostate is best ascertained by examination per anum. The existence of stricture, or stone in the bladder, &c., should be ascertained by the sound, by the catheter, bougies, &c. (*See also the articles* Diabetes, Kidneys—*diseases of*, Prostate, Urine, and Urinary Bladder.)

219. ii. Signs and Symptoms of the Sexual Organs.—*A. These symptoms in the male* have not generally received that amount of attention which they require, as respects the states of the constitution, the diseases of particular organs, and especially those of the brain and spinal cord. The lesions to which male organs are primarily and locally liable have been ably discussed by modern surgical and medical writers: it is chiefly as to the manner in which these organs are affected, sympathetically, in the course of other maladies, that a brief notice will be taken of them at this place. In health, the testes and penis are well developed, and the scrotum is more or less contracted; the cremaster muscles evincing sufficient tone to draw the testes close to the penis. In rare instances, one or even both testes may not have descended into the scrotum, and may have

been arrested in some part of their course from the abdomen to the scrotum.

220. In *diseases* of vital depression or exhaustion, especially in fevers, in diseases of the digestive organs, and particularly of the stomach and intestines, the dartos and scrotum are no longer corrugated, the cremasters are incapable of contraction, and the testes hang down unusually low. In nephritis, and in calculus or other diseases of the kidney, the cremaster of the same side as that in which the kidney is affected is contracted, the testis drawn up close to the penis, or even to the external abdominal ring, and a darting or aching pain often is felt in the testis of that side, or extends along the cord. In those diseases in which the cremaster and scrotum are so remarkably relaxed, as just stated, the venereal desire is for the time extinguished; but with convalescence from them, especially from fevers, a restoration of the contraction of these parts, and of the sexual desire, is one of the most certain signs of recovery, as evincing a return of nervous power in both the organic and spinal nervous system.

221. Inordinate relaxation of the cremasters and scrotum, often with more or less wasting of the testes, and sometimes with both softness and wasting, takes place in those who have prematurely or inordinately exercised their genital organs or been guilty of self-pollution. By these persons the venereal congress can no longer be either satisfactorily or fruitfully exercised. The seminal fluid is neither sufficiently nor healthily secreted, the organs being rendered incapable of discharging their functions. Hence Impotence, and one of the causes of Sterility. (*See those articles.*) Persons who have thus destroyed their sexual functions, or who have greatly weakened them, and those who have been accustomed to sexual intercourse and who have relinquished such intercourse, are often subject to involuntary discharges during sleep, and are thereby more or less exhausted. When these involuntary pollutions are complained of, it may generally be inferred that the individual had prematurely or inordinately addicted himself to sexual excesses or to self-pollutions, and that having become aware of the injury they had produced, and abstained from them, the debility and morbid irritability thereby occasioned still persisting, the sympathetic excitement of a venereal dream proved sufficient to produce a seminal discharge. (See *art.* Pollution.)

222. The sexual organs having been so exhausted by premature, or excessive, or unnatural use, as to give rise to impotency, and the feeling of incompetence having taken possession of an individual's mind, so as to prevent him from entering upon the married state, or from exercising these organs, the disuse actually increases the wasting, softening, or decay of these organs, and, with such decay, constitutional vigour, or vital energy, becomes impaired. A very large proportion of bachelors are actually impotent after 30 or 35 years of age, and, being conscious of their prematurely exhausted powers, prudently abstain from sacrificing the happiness of the opposite sex. All are not, however, so prudent, for some marry from various motives, although capable only of exciting a desire which they cannot gratify. Owing to the cause now noticed, the duration of life among bachelors is considerably less than among married men.

223. Loss or increase of sexual desire depending thus, 1st, upon the states of the organs concerned in the performance of the sexual functions; 2d, upon the activity or excitement of those sources of nervous energy actuating these organs; and, 3d, upon the general condition of the body, it follows that either loss or increase of this desire becomes a symptom of disease in one or other of these quarters. It has just now been shown that the organs destined to the performance of the sexual function may be exhausted, or altogether worn out, or disorganized, by premature or excessive use, or subsequent disease. Nevertheless, the desire may exist, although performance is most imperfect, or even impossible. When this is the case, excitement is present in the sources of nervous power actuating these organs, either in the nervous centres at the origins of the nerves supplying these organs, or in the mind acting upon these centres, although these organs themselves may be incapable of discharging their offices. The excitement may be mental only—a mere passing or temporary feeling—but it may be more permanent, or even remarkable and uncontrollable; and, in this case, there is always reason to infer the existence of irritation or inflammatory action in those parts of the nervous centres— ganglial, cerebral, or spinal—most intimately related to the nerves supplying these organs. Diseases implicating the whole frame, as fevers, &c., are rarely attended by increased sexual desire, unless during convalescence from them. On the contrary, this desire is altogether abolished during their duration, while at the same time the sexual organs are collapsed, the testes dependent, and the scrotum flaccid and disposed to erythematous inflammation and excoriations. In acute, inflammatory, and febrile diseases, the sexual functions and desires are either impaired or abolished at their commencement, and during their continuance In diabetes, in severe influenza, general debility, in some diseases of the brain, and in all acute maladies of the digestive canal, the sexual desire is lost.

224. The sexual desires and powers are seldom very remarkably impaired in chronic diseases of the lungs and heart, especially in tubercular consumption, and particularly in the more chronic and non-febrile states of this malady, in which they even may continue almost to the last. The same may be said of diseases of the ovaria and uterus, and, in a less degree, of chronic affections of the liver, spleen, and kidneys. Too frequent erections without sufficient cause, and seminal discharges at the commencement of, or too early in, an erection, is a sign of general debility, or of susceptibility and morbid irritability of the sexual organs consequent upon masturbation or sexual abuses, or upon irritation of the urethra, at the caput gallinaginis, or of stone in the bladder, or of ascarides in the rectum. But discharges from the prostate gland should be distinguished from seminal emissions, the former being much more frequent than the latter. Continued erection—*priapism*—is sometimes occasioned by calculi in the kidneys or bladder, by gonorrhœa, by epilepsy, &c.

225. *B. Signs connected with the sexual Organs of the Female.*—Retardation of the development of the female organs is occasioned chiefly by deficiency or atrophy of the ovaria. Want of sexual desire may proceed from the same cause, or from extreme debility, or from the same diseases as have produced this state in the male (§ 220).

Excessive sexual desire is a symptom of irritation or inflammatory action of the ovaria, or of active congestion or vascular determination to the uterus; or of masturbation, which had commenced early and been long continued. (*See farther, in illustration of this subject, the articles on* Impotence and Sterility, *on* Leucorrhœa, Menstruation, *on* Self-pollution, *on the diseases of the* Ovaria, *of the* Uterus, Vagina, &c.)

☞ The following *Synopsis* or *Contents* of the preceding article, with the number of the paragraph commencing each topic, may be useful by facilitating reference.

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Bibliog. and Refer. — *Hippocrates*, Prænotiones, Prognosticon, Aphorismi, &c., &c., in Op., ed. Fœsii, Genevæ, 1657; et ed. Vander Linden. Lugd. Bat., 1665.—*Cœlius Aurelianus*, De Morbis Acutis et Chron., lib. viii., ed. Amstelod., 1755.—*Aretæus*, Opera Omnia, ed. Kühn. Lips., 1828.—*Galenus*, Opera. Basil., 1538, *pluries*.—*U. Binder*, Epiphania Medicorum, &c. 1506.—*Galenus*, De Symptomatum Differentiis, lib. i., Thoma Linacre interprete, 4to. London, 1523.—*N. Bertruccius*, Methodus Cognoscendorum Morborum, 4to. Mongunt., 1534.—*J. Sylvius*, De Signis Omnibus Medicis, &c. Par., 1539.—*J. Huygel*, De Semiotica Medicina Parte, fol. Basil., 1560.—*J. B. Pellegrini*, De Ratione Cognoscendi Signa et Causas Morborum, 4to. Bonon., 1563.—*A. Planer*, Methodus Investigandi Locos Affectos, 4to. Tub., 1579.—*N. Piso*, De Cognoscendis et Curandis Morbis, fol. Franckf., 1580.—*F. Dupont*, De Signis Morborum, lib. iv. (edit. Schomberg, 4to, London, 1765), 4to. Paris, 1584.—*D. Liddel*, De Symptomatibus et Symptomatum Differentiis, 4to. Helmst., 1595.—*J. Aubertus*, Σημειωτικὴ, Sive Ratio Dignoscendarum Sedium male Adfectarum et Affectionum, 8vo. Genev., 1596.—*P. Alpinus*, De Præsagienda Vita et Morte Ægrotantium, lib. vij., 4to. Venet., 1601.—*J. Jessenius*, Σημειωτικὴ, Seu Nova Cognoscendi Morbos Methodus, 8vo. Vittemb., 1601.—*G. Horstius*, De Doctrina Signorum in Genere, 4to. Vittemb., 1607.—*J. Wolfii*, Exercitat. Semioticæ in Cl., Galeni de Loc. Affect., lib. vj. Helmst., 1620.—*J. Varandé*, Tractatus de Diagnosi Medica, 8vo. Monspel., 1620.—*P. Forestus*, De Incerto Urinarum Judicio. Francf., 1610.—*P. Savona*, Decisiones Medicinales quoad Diagnosin et Prognosin, fol. Panorm., 1624.—*A. Constantinus*, Op. Medicæ Prognoseos. Lugd., 1613.—*P. Casulanus*, De Lingua, quæ Maximum est Morborum Acutorum Signum, 12mo. Colon., 1626.—*R. Fludd*, De Pulsuum Scientia. Oxon., 1649.—*J. Sylvius*, De Signis Omnibus Medicis, fol. Paris, 1639.—*P. Finella*, De Quatuor Signis quæ apparent in Unguibus, 12mo. Neap., 1649.—*J. B. Van Helmont*, De Morbis Introductio Diagnostica (Opp.), fol. Venet., 1651.—*C. Bennet*, Exercitationes Diagnosticæ, cum Historiis Demonstrativis, 8vo. Lond., 1654.—*J. Prævotius*, Semioticæ, sive de Signis Medicis Enchiridion, 24mo. Venet., 1654.—*E. Martinez*, Tractatus de Modo Cognoscendi Morbum, &c., fol. Complut., 1657.—*T. Fienus*, Semeiotica, sive de Signis Medicis Tractatus, 4to. Lugd. Bat., 1664.—*J. C. Hœnn*, Quo quis rectius cognoscit Morbum, eo rectius sanat, Oratio, 4to. Altd., 1675.—*G. W. Wedel*, Exercitationes Semiotico-pathologicæ, 4to. Jenæ, 1700.—*J. P. Eysel*, Compendium Semiologicum, Modernorum Dogmatibus Accommodatum, 8vo. Erford, 1701.—*J. H. Fursteneau*, Dissertatio quæ Desiderata circa Morbos eorumque Signa exponit, 12mo. Amst., 1712.—*F. Hoffmann*, De Morbis recte Distinguendis, 4to. Hal., 1718.—*C. Vater*, Semiotica Medica, Succinctis Aphorismis Comprehensa, 4to. Vittemb., 1722.—*H. Cope*, Demonstratio Medico-Practica Prognosticorum Hippocratis. Dubl., 1736.—*J. Juncker*, Conspectus Pathologiæ et Semeiologiæ in Forma Tabularum, 4to. Halæ, 1736.—*G. Detharding*, Fundamenta Semeiologiæ Medica, 8vo. Harnlæ, 1740.—*S. Rudd*, A certain Method to know Diseases, &c., 4to. Lond., 1742.—*S. Schaarmidt*, Semiotik; herausgegeben von C. A. Nicolai, 8vo. Berl., 1756.—*J. G. Klein*, Interpr. Clinicus, &c. Francf., 1759.—*G. E. Hamberger*, Semiotische Vorlesungen ueber Lommen's Wahrnemungen, 8vo. Lemgov., 1767—*J. L. L. Læsecke*, Semiotik, oder Lehre von der Zeichen der Krankheiten, 8vo. Dresd., 1768.—*Malrien*, Les Présages de la Santé et des Maladies, ou Hist. Univers. des Signes Prognostics. Paris, 1770.—*M. Helian*, Dictionnaire du Diagnostic, ou l'Art de Connaître les Maladies, 12mo. Paris, 1771.—*C. G. Gruner*, Semiotice in usu prælectorum, 8vo. Hal., 1775.—*J. Berkenhout*, Symptomatologia. 8vo. Lond., 1784.—*J. D. Metzger*, Grundriss der allgemeinen Semiotik und Therapie. 8vo. Königsb., 1785.—*F. A. Weber*, De Signis et Causis Morborum, 2 vols., 8vo. Heidelb., 1786.—*N.*

F. Rougnon, Considerationes Pathologico-Semeioticæ de Omnibus Corporis Functionibus, 2 vols., 4to. Vesunt., 1787.—*T. Bayer*, Grundriss der Allgemeinen Semiotik, 8vo. Prag., 1787.—*J. C. T. Schlegel*, Thesaurus Semiotices Pathologicæ, 2 vols., 8vo. Stend., 1787.—*J. P. Frank*, Oratio de Signis Morborum e Corporis Situ Partiumque Positione Petendis, 8vo. Pap., 1788.—*J. C. Hoffbauer*, Tentamina Semiologica, 8vo. Gorlitz., 1879.—*D. F. Büttner*, Critices Semiologiæ Medicinalis Fundamenta, 8vo. Bost., 1791.—*P. P. Price*, A Treatise on the Diagnosis and Prognosis of Diseases (part i.), 8vo. Lond., 1791.—*M. Stoll*, Allgemeine Anleitung Kranke zu examiniren, 8vo. Warb., 1792 (?).—*J. C. G. Ackermann*, Bemerkungen ueber die Kentniss und Kur einigen Krankheiten, 8vo. Nürnberg, 1794.—*S. G. Vogel*, Kranken-examen, 8vo. Stendal., 1796.—*J. L. V. Broussonnet*, Tableau Elémentaire de la Séméiotique, 8vo. Montp., 1798.—*Anon.*, A Table of Symptoms, pointing out such as distinguish one Disease from another, &c., 8vo. Lond., 1799.—*C. G. Gruner*, Physiologische und Pathologische Zeichenlehre, 8vo. Jena, 1800.—*F. G. Kornatowsky*, Kunst Krankheiten genau und grundlich zu untersuchen, 8vo. Leips., 1800.—*F. Cabuchet*, Essai sur l'Expression de la Face dans les Maladies, 8vo. Par., 1801.—*K. Sprengel*, Handbuch der Semiotik, 8vo. Halle, 1801.—*J. E. Wichmann*, Ideen zur Diagnostik; beobachtenden Aerzten mitgetheilt, 3 vols., 8vo. Hannov., 1802.—*W. F. Dreyssig*, Handbuch der Medicinischen Diagnostik, 2 vols., 8vo. Erfurt, 1803.—*L. Laforgue*, De la Séméiologie Buccale, 8vo. Par., 1806.—*L. M. A. Caldani*, Institutiones Semiotices, 8vo. Patav., 1808.—*J. F. Hernandez*, Mémoire sur les Questions, quels sont les Signes Diagnostiques et Prognostiques fournis de l'Etat de la Langue, &c. (?), 8vo. Toulon, 1808.—*Anon.*, Recueil Alphabetique des Prognostics Dangereux et Mortels, &c., 8vo. Paris, 1808.—*C. G. Schmalz*, Versuch einer Medicinisch-Chirurgischen Diagnostik in Tabellen, fol. Dresd., 1808.—*A. N. Guiton*, Considér. Séméiologiques appliquées à l'Art d'observer les Maladies. Paris, 1809.—*K. Wolfahrt*, Ueber die Bedeutung der Zeichenlehre in der Heilkunde, 8vo. Berl., 1810.—*F. Dauz*, Allgemeine Zeichenlehre, 8vo. Leipz., 1812.—*Renauldin*, Dict. des Sc. Méd. (art. *Diagnostic*), t. ix. Par., 1814.—*A. J. Landré-Beauvais*, Séméiotique, ou Traité des Signes des Maladies, 8vo. Par., 1815.—*M. Hall*, On Diagnosis, in four parts, 8vo. Lond., 1817.—*F. J. Double*, Séméiologie Générale, ou Traité des Signes, &c., 3 toms. 8vo. Par., 1811–17.—*C. W. Hufeland*, Conspectus Morborum: Adjectis Characteribus Specificis Diagnosticis, 8vo. Berl., 1819.—*Serrurier*, Dict. des Sc. Méd. (art. *Séméiotique*), fol. Par., 1820.—*A P. Buchan*, Symptomatology, or the Art of Detecting Diseases, 8vo. Lond., 1821.—*M. Hall*, An Essay on the Symptoms and History of Diseases, 8vo. Lond., 1822.—*Chomel*, Dict. de Méd. (art. *Diagnostic*), t. vi. Par., 1823.—*M. Hasper*, Novus Thesaurus Semiotices Pathologicæ, 8vo. Lips., 1824.—*L. Martinet*, Manuel de Clinique, ou des Méthodes d'Exploration en Médicine, 8vo. Par., 1824.—*M. E. A. Naumann*, Handbuch der Allgemeinen Semeiotik. Berl., 1826.—*J. B. Friedreich*, Handbuch der Pathologischen Zeichenlehre, 8vo. Wurtz 1825.—*J. Vosmaer*, Institutiones Semeioticæ, edit. a G. J. Mulder. Lugd. Bat., 1828.—*F. Nasse*, Leichenoffnungen zur Diagnostic, &c., 8vo. Bonn, 1828.—*Piorry*, In Journ. Hebdom. de Méd., t. i., p. 412.—*L. Rostan*, Cours de Médicine Clinique, ou Traité de Diagnostic, &c., 3 vols., 8vo. Par., 1830.—*Jolly*, Dict. de Méd. Prat. (art. *Diagnostic*), t. vi. Par., 1831.—*J. F. H. Albers*, Lehrbuch der Semeiotik für Vorlesungen. Leipz., 1834.—*M. Hall*, The Principles of Diagnosis, 2 vols. Lond., 1834; and Cyc. of Pract. Med. (art. *Symptomatology*), vol. iv. Lond., 1834.—*Dance*, Guide pour l'Etude de la Clinique Médicale, ou Précis de Séméiotique. Paris, 1834.—*P. M. Latham*, Lectures on Subjects connected with Clinical Medicine, 8vo. Lond., 1836.—*Knolz*, Institutiones Medicæ Hygienes et Semeiotices Generalis Usui Academico Accommodatæ. Viennæ, 1835.—*Schill*, Outlines of Pathological Semeiology, Transl. from the German, by D. Spillan. Lond., 1839.—*G. B. Wood*, A Treatise on the Practice of Medicine, 2d edit.; *Symptomatology*, vol. i., p. 159. Philadelphia, 1849.

[Am. Bibl.—*S. H. Dickson*, Elements of Medicine, 8vo. Phil., 1855.—*R. Dunglison*, The Practice of Med., 3d ed. Philadelphia, 1855.—*B. Rush*, Med. En., and Observations, &c.—*J. Eberle*, A Treatise on the Theory and Pract. of Med., 2 vols.]

SYNCOPE.—See Fainting and Swooning.

SYPHILIS.—See Venereal Disease.

TABES. — Synon. — *Marasmus; Atrophia; Phthisis; Macies*, Auct. These terms, as well as *tabes*, are usually employed, *generically*, to express *emaciation of the whole body with languor, and generally with some degree of hectic fever;* but to these terms are usually added certain specific appellations, according to the cause and nature of the emaciation, atrophy or tabidity, in particular cases, as the *Tabes* or *Atrophia Infantum* or *infantalis.—T. Mesenterica, glandularis, scrofulosa*, &c.— *T. Diabetica.—T. Lactantium (of Nurses).—T.* or *P. pulmonalis, Marasmus senilis.—T.* or *M. dorsalis* or *dorsualis.— T. cozaria; Tabidity, Atrophy, Emaciation, Decline.*

Classif.—IV. Class, III. Order (*Author in Preface*).

1. Defin.—*Chronic emaciation of the body, with weakness and aching of the back and loins, languor, debility, and impotency.*

2. *Tabes, Marasmus*, or *Atrophy*, is considered at sufficient length in the articles treating of the diseases, chiefly organic, on which this state, however named, actually depends. According as it proceeds from obstruction of the mesenteric glands, so it is described in the article on diseases of the Mesentery; and as arising from tubercles in the lungs or other viscera, it is treated of under the heads Tubercular Consumption, and Scrofula and Tubercles. The other pathological conditions, of which extreme emaciation is a contingent or an occasional result merely, are so very numerous, that even an enumeration of them at this place is unnecessary, especially as they have been noticed in connexion with this effect under their respective heads. But there is one form of tabes to which attention may be farther directed than it has been, when treating of one of its most common causes, as well as of its usual consequences, namely, *self-pollution*, and *impotence and sterility*.

3. Tabes dorsalis, in its various forms and with its several concomitants, is of much greater importance to the individual himself, as well as to those connected with him, than has usually been considered; and, although imputed solely to the male sex, the same affection, produced chiefly by similar causes and characterized by nearly similar symptoms, is not infrequently also observed in the female. In the former sex it is generally *caused* by premature or excessive sexual excitement, or by consequent involuntary pollutions; in the latter it is also occasioned by the same causes, and by prolonged leucorrhœa commonly consequent upon self-pollution.

4. i. *The symptoms* in both sexes are chiefly extreme emaciation, a weak and bent state of the spinal column; the lumbar region of the spine having lost its posterior concavity, and having become either straight or convex, owing to the softened yielding or atrophied state of the intervertebral substance. The gait is unsteady and vacillating, the knees bend under the weight of the body, and all the muscular movements and mental manifestations evince debility, exhaustion, impaired powers of exertion, application and attention. The genitals are often flaccid, wasted, or soft and small in the male, and are subject to leucorrhœa in the female; the eyes are sunk, and the whole body is emaciated. If the causes are continued, various functional and organic lesions supervene, especially nervous affections, varying in character with the peculiarities and circumstances of individual cases, hysteria, hypochondriasis, mental depression or delusion, tremours, extreme susceptibility, anæmia, and ultimately epilepsy, incomplete or complete, partial or general paralysis, insanity, and the several other consecutive maladies mentioned when

treating of voluntary and involuntary POLLUTIONS.

5. ii. *The Prognosis* in tabes dorsalis entirely depends upon the changes which the spinal cord has undergone, and upon the secondary affections which have appeared. The nature of the changes, however, which may have taken place in the cord can be inferred with but a slight degree of certainty; for the cord may be partially softened, or it may be atrophied, or indurated, or both wasted and indurated; and the fluid existing between the spinal membranes may be increased, or the venous sinuses of the spine may be remarkably congested. The prognosis will greatly depend, not only upon the progress of the disease, but also upon the continuance of its principal cause; for too frequently the vice in which it has originated is persisted in, notwithstanding the conviction of the miseries which result. Although the disease may not be cured, or even much relieved, life may be prolonged for a considerable period.

6. iii. *Treatment.*—The means which have been recommended for DEBILITY, IMPOTENCY, and for POLLUTIONS, voluntary and involuntary, are altogether appropriate to this complaint, which commonly, as just stated, proceeds from the same causes as these. But unless the causes be relinquished, the means of cure may be most judiciously resorted to without avail. Of these means, chalybeate mineral waters and preparations, change of air, and residence in a dry and temperate air, frictions and stimulating embrocations along the spine; the iodide of iron taken in the sirup of sarza; the preparations of cinchona, of gentian, of valerian, of sumbul, &c., are the most beneficial, aided by suitable diet, exercise, and regimen.

BIBLIOG. AND REFER.—*Hippocrates*, Opera, Ed. Fœsius, p. 479, et p. 539.—*Avicenna*, Canon. l. iii. Fen. 20, Tract. ii., cap. 11.—*Tulpius*, l. iii., cap. 24.—*Crause*, De Nutritionis Impedimentis ab Immatura vel nimia Venere. Jenæ, 1588.—*Morton*, Phthisiologia, p. 8.—*Willis*, Pharmac. Rat., P. ii., S. i., cap. 5.—*Brendel*, De Tabe Dorsali. Goett., 1749.—Opera, t. ii., p. 179.—*Anon.*, Pract. Essay on the Tabes Dorsalis. Lond., 1748.—*Anon.*, Tabes Dorsalis, the Cause of Consumption in Young Men. Lond., 1752.—*J. E. Wichmann*, De Pollutione Diurna frequentiori, sed rarius observata Tabescentiæ Causa. Goett., 1782.—*Percy*, Dissert. on the Lues Venerea, Gonorrhœa and Tabes Dorsalis. Lond., 1787.—*W. Ploucquet*, Exemplum Singularis Morbi Paralytici. Tub., 1806. (*Atrophy of the Spinal Cord.*)—*Kortum*, In Hufeland, Journ. der Pract. Heilk., B. xx., st. 2, p. 12. (*Recommends Quassia.*)—*J. P. Frank*, De Cur. Hom. Morbis, l. v., p. 201.—*Sontag*, In Franck's Delect. Opusc. Med. German, vol. vii., p. 299.—*Schneider*, Journ. des Progrès des Sciences Médicales, t. viii., p. 258. (*Erectio nulla sed Pollutiones noct. cum Tabe Dorsali.*)—*F. Lallemand*, Des Pertes Seminales Involuntaires, 3 t., 8vo. Paris, 1839-41.—*M. H. Romberg*, A Manual of Nervous Diseases of Man, transl. by *E. H. Sieveking*. Lond., 1853. 8vo, vol. ii., p. 395. —(*See also the* BIBLIOG. AND REFERENCES to the Articles DEBILITY, IMPOTENCY, and STERILITY, and to POLLUTIONS, VOLUNTARY and INVOLUNTARY.)

TETANUS and TRISMUS.—SYNON.—*Τέτανος* (from *τείνω*, I stretch), Auct. Græc. *Tetanus*, Pliny, Vogel, Swediaur, Sauvages, Cullen, &c. *Tonos Trismus*, Parr. *Entonia rigida*, Young. *Entesia Tetanus*, Good. *Catochus*, Auct. *Tétanos*, Fr. *Todtenkrampf, Starrkrampf*, Germ. *Tetano*, Ital. *Tetanos Erectus, vel T. Proprius; Tetanus, Tetany. Tonic or Entonic Spasm.*

TETANUS EMPROSTHOTONOS — *ἐμπροσθότονος*, from *ἔμπροσθεν*, forward, and *τείνω*, I stretch—when the body is bent forward. *Tetanus Anticus*, Good. Tetanic Procurvation.

TETANUS OPISTHOTONOS — *ὀπισθότονος*—from *ὀπισθεν*, backward, &c., when the body is bent backward. *Tetanus Dorsalis*, Good. Tetanic Recurvation.

PLEUROSTHOTONOS, from *πλευροσθεν*, sideward, *πλευρὸν*, the side, &c., when the body is bent laterally. *Tetanus lateralis*, Sauvages.

TRISMUS—*τρισμὸς*, from *τρίζω*, I gnash—when the muscles of the jaws are chiefly or solely affected. *Entasia Trismus*, Good. Locked-jaw.

CLASSIF.—*4th Class*, Nervous Diseases. *3d Order*, Spasmodic Affections (*Cullen*).—iv. *Class*, Diseases of the Nervous Function. iii. *Order*, Affecting the Muscles (*Good*). —II. CLASS, III. ORDER (*Author in Preface*).

1. DEFINIT.—*A tonic state of Spasm, or entonic Spasm, extending to many or to most of the muscles of animal life or voluntary motion—with exacerbations, and usually without any period of complete relaxation until the subsidence of the malady, its progress being generally acute or subacute, and often most rapid, and then terminating life by asphyxia.*

2. The *Pathology* and *Treatment* of Tetanus and Trismus have been subjects of discussion with both medical and surgical writers during many years, and even the most experienced and the ablest writers have confessed their inability to furnish satisfactory information respecting them. As tetanus is most frequently a consequence of surgical operations and of external injuries in temperate climates, physicians are not often called to its treatment. Nevertheless, it behooves them, as much as surgeons, to be acquainted with all that is known of both the nature and the treatment of this malady. Although it, as well as trismus, is most frequently symptomatic, yet it occasionally appears primarily or idiopathically; rarely in this climate, but not infrequently in hot climates, especially in the dark races.

3. According to its *severity* and *duration*, tetanus has been divided into *acute* and *chronic*; but in neither point of view can it be considered to be, in any case, a chronic disease. If any such division be adopted, the *acute* and *sub-acute* states may be assigned to it; but this division is altogether arbitrary, as no line of demarcation can be drawn between them. *Primary* or *idiopathic tetanus* is either acute or sub-acute, is often less violent than the symptomatic, and is less dangerous, especially in temperate climates. The *symptomatic* or *traumatic tetanus* is commonly acute, and is a most dangerous malady. Besides the divisions now noticed, certain forms have been described which are characterized by peculiar symptoms, which are merely manifestations of the disease in greater severity, or to a more limited extent in some muscles than in others. The partial state of the disease, *trismus*, is that in which the more general forms commence—the forms usually recognised being *trismus, pleurosthotonos, emprosthotonos, opisthotonos*, and *tetanus erectus*; but two or more of those forms may appear in the progress of the same case, according as the morbid action of the muscles extends or predominates in one set of muscles over the others.

4. I. DESCRIPTION.—The *symptoms* of tetanus in all their forms are very readily recognised, but not until those characteristic of the malady appear. Those which are *premonitory* of the attack, or which occur in the period which elapses between the cause and the declared disease, have

not been satisfactorily observed. It cannot be supposed that this period is without any premonition of the impending malady. I have remarked uneasiness or pain at the epigastrium and about the throat; much lassitude, with restlessness and depression of spirits; chilliness or cold chills, especially in the idiopathic; uneasiness and anxiety at the præcordia; twitchings of the muscles of the injured limb, in some cases of the traumatic form; and obstinate constipation in every form of the disease. These symptoms may be of short duration, or they may be experienced for a considerable time: they are followed by pain under or below the sternum, often extending backward to the spine, by more or less difficulty of swallowing, by pain and stiffness of the neck, &c. To these are generally soon added all the other symptoms which characterize the more partial or limited form of the disease, namely, rigidity, pain or contraction of the muscles of the lower jaw.

5. *a. Trismus* may be viewed as the commencement of all the forms of tetanus. With or following the pain under the sternum and difficulty of swallowing, the patient complains of uneasiness or stiffness of the muscles of the jaws, neck, and throat, and pain in the course of the cervical region of the spine. To these succeed a difficulty in opening the jaws, in masticating or swallowing food, and in rotating or even in moving the head. The muscles which raise the lower jaw assume a state of contraction or tonic spasm, so that the teeth are kept in constant contact (*locked-jaw*). This symptom is first indicated when the patient is desired to show his tongue, and soon is followed by more or less spasm of all the muscles of the face. The angles of the mouth are retracted, the alæ nasi are elevated, and the nostrils expanded; the eyes are fixed and prominent, the brows and forehead drawn and wrinkled, the countenance presenting an anxious or distressed expression. In children, or rather in young infants, the disease may not proceed farther, as respects the tetanic affection of the muscles, and yet it may terminate fatally, more or less rapidly, either in convulsions or in asphyxia. This limitation and this course of the malady are very rare in adults, the state of trismus generally advancing quickly to those about to be mentioned.

6. *b. Pleurosthotonos*, or *tetanus lateralis*, is a predominant spasm of the muscles of one side, drawing the body to that side. This form very seldom occurs. It commences with trismus, or with the affection of the muscles of the face and neck, and often passes into one or other of the forms about to be noticed. The lateral curvature is not always considerable, for it is produced rather by a greater severity of the spasms in one side than by any limitation of them to that side. I have observed the form in a child, in an idiopathic form, death occurring during a violent convulsion from asphyxia.

7. *c. Emprosthotonos* is the predominant contraction of the muscles of the anterior aspect of the trunk, by which the body is bent forward and the head is drawn to the sternum. This state is rarely observed during the whole course of the malady. It may occur for a short time, and be followed by either opisthotonos or tetanus erectus. It, as well as the other forms of the disease, commences with trismus, which in it, as in the others, continues throughout.

8. *d. Opisthotonos* is the bending backward of the trunk by the excessive action of the muscles of the posterior parts of the neck, back, and loins. This is the most frequent form of the disease. The numerous strong extensor muscles of the spine overcome the action of the flexor muscles of the abdomen, and produce a rigid curvature, or posterior concavity, the body resting during the exacerbations upon the occiput and heels only, the jaws being also forcibly closed, and the abdominal muscles contracted. This form may be followed by, or may alternate with the next, the *tetanus proprius*.

9. *e. Tetanus*, although designating any of the forms of the disease attended by general spasm, and being the generic appellation, is often intended to convey the idea of a state of the disease in which the body is stretched out by the spasms without being very manifestly bent in any direction—*tetanus erectus*, not *tetanus proprius*. It may follow, in the progress of the malady, either of the states already noticed, presenting at intervals the form of opisthotonos, the posture assumed by the trunk depending upon a momentary or temporary predominance of action of certain muscles or series of muscles; or it may appear in this form consecutively upon the premonitory symptoms, and the partial affection of the face and neck, and preserve it throughout.

10. *A.* Acute Tetanus.—This common form of the disease may be either symptomatic or idiopathic. It may result from propagated irritation, and present no satisfactory evidence of inflammation of the membranes or substance of the spinal medulla; or irritation may superinduce inflammatory action, with the usual symptoms, or even be attended by such symptoms from the commencement, especially in the idiopathic form. (See Pathological Inferences, &c., § 61, *et seq.*)—*a.* After a more or less evident manifestation of premonitory symptoms (§ 4, 5), contractions, generally persistent, commence in the muscles of the face and neck—the stage of *trismus*. These contractions extend downward to the muscles of the back and trunk, and often also to those of the limbs; and the disease assumes either of the forms now stated, but most frequently the two last specified. The jaws generally continue firmly closed, and, although the contraction of the muscles of voluntary motion—of both trunk and limbs—or the rigidity of these muscles, remains uninterrupted, violent paroxysms or exacerbations of the contraction recur after short intervals, or after from five to fifteen minutes, and are attended by extreme pain and distress. As the disease advances, the exacerbations become more violent or prolonged; the body is bathed in a warm perspiration; the pain at the præcordium is increased; respiration is laboured, embarrassed, or hurried; and the pulse becomes very rapid and often irregular. The exacerbations are induced by the slightest causes—by a current of air, by attempts to move or to swallow, or by unpleasant sounds, or by a strong glare of light.

11. As the disease continues, the voice becomes altered, harsh, and disagreeable, the larynx is raised upward, and the tongue is often forced against the teeth during the exacerbations and lacerated. The shoulders are drawn forward, and the body is either extended or forced into the other positions already noticed, according as the action of one set of muscles predominates over their antagonists. The sense of tightness and

the pain under the sternum and ensiform cartilage continue to extend to the spine, and are attended by a laboured, quick, and difficult respiration, and by an agonizing feeling of suffocation. The muscles of the face are strongly contracted, while the countenance is pale or livid, and bathed in perspiration. The patient expresses the most distressing sufferings, both from pain and from the difficult respiration, particularly during the exacerbations, which are more frequent, prolonged, and violent as the malady advances, the respiratory muscles, and even the diaphragm, ultimately becoming more or less affected. Owing to this extension of the spasm the patient is carried off by asphyxia, especially in the more acute or rapid traumatic cases; but in the more subacute and idiopathic cases, when the disease has been of much longer duration, the severity of the symptoms often abates previously to death, and the patient sinks apparently from exhaustion, but even in these a recurrence or an extension of spasm to the respiratory muscles sometimes terminates life.

12. *b.* Such is the usual course of this malady, but each case presents certain modifications of the symptoms during its progress. The earliest or the most constant precursory symptom is obstinate constipation, and this generally continues throughout the disease. The pain at the epigastrium, and anxiety under the sternum and at the præcordium, are the next, and these are very prominent, equally persistent, and generally extend to the spine. Inability to swallow is owing to spasmodic action of the muscles of the tongue and pharynx, and probably also of the œsophagus, often implicating also the glottis, attempts to swallow liquids being often followed by their forcible rejection through the nose and mouth. This state of spasm is such as prevents the introduction of a flexible tube down the œsophagus from one of the nostrils. The difficulty of defæcation, owing to the spasm of the sphincter ani, increases the constipation, and a similar difficulty attends micturition, the urine being sometimes retained, or forcibly ejected by the spasm of the abdominal muscles. The spasms of the muscles of the face occasion remarkable distortion of the features, young persons often presenting the appearance of age. Respiration is chiefly affected during the exacerbations. It is then catching, difficult, and painful, the pain extending from the ensiform cartilage and præcordium to the spine, or darting in the direction of the diaphragm, and being most probably occasioned by spasm of this muscle. The pain in this situation, at an advanced period of the disease, is different from that experienced under the sternum at the commencement. The spasmodic contraction of the muscles is attended by more or less suffering; but this is said not always to be the case. The exceptions are certainly rare, for I have never seen an instance to the contrary, although the distress has been much less in some cases than in others, and experienced only during the paroxysms.

13. The greatest diversity is presented by the extent and severity of the spasms, and by the state of the pulse in different cases. While in some the muscles of the face and neck, and particularly the muscles closing the jaws, are chiefly or solely attacked (*Trismus*), those of the trunk and limbs being but slightly or not at all contracted; in others the muscles of the face are much less affected, while those of the trunk and limbs are severely attacked. Mr. Curling, in his excellent work, remarks, that the muscles of the eye are sometimes, but not generally, affected. When this occurs, the eyeball is fixed and drawn slightly inward, the patient being unable to direct it towards particular objects. Most frequently, however, these muscles are free, the eyelids being half closed, the contractions of the orbicularis palpebrarum, in this case, being unopposed by spasm of the levator palpebræ. The pupil of the eye has been said to be contracted in tetanus, by some writers, and to be dilated by others. I believe it to be generally contracted, but that it may become dilated with the supervention of the cerebral congestion connected with incipient asphyxia. The muscles of the extremities are less frequently or less severely affected than those of the face, neck, and trunk, the forearms and hands being generally the least affected; but much depends upon the seat and nature of the injury of which the disease is the effect, for the spasms sometimes commence or are most violent in the injured limb. When the disease has followed amputation, the spasms of the muscles of the stump and limb are often most distressing. The spasms being thus more or less general and severe, as respects the voluntary muscles, and ultimately extending to the sphincters, and to the respiratory muscles in the more acute cases, the violent and continued spasms of these latter muscles generally terminating life in these cases, it may be inquired, 1st, whether or no the spasms extend also to involuntary muscles; and, 2d, whether sleep has any influence in relaxing them.

14. 1st. It has been supposed by Currie, Parry, Howship, Travers, and others, that death, in tetanus, is caused by the extension of spasm to the heart; but, with Mr. Curling, I doubt the existence of spasm of this organ, even as a termination of the disease. There can be no doubt that the inordinate actions of the voluntary muscles occasion a quick return of blood to the right side of the heart at the accession of the paroxysms, and rapidity as well as irregularity of the action of this organ; but any degree of spasm of it would be incompatible with the continuance of life. But although spasm of the heart is not present in the course of the malady, it may occur and terminate life; and Mr. Howship has adduced a case in which he believed, from the state of the heart observed after death, that spasm of this organ was the cause of death. The examination, in this instance, was made eleven hours after death, at which time the body is generally still warm, and the heart firmly contracted. In two most acute traumatic cases, which I examined after death, the heart did not present any appearances different from those observed in cases of sudden or rapid death from other causes. Both these cases terminated in asphyxia. Mr. Curling refers to a case for which amputation was performed by Mr. Liston, and in which the vessels contracted so much that there was no hæmorrhage, and ligatures on the mouths of the divided vessels became unnecessary. I am not acquainted with any similar case. The contraction certainly could not have existed to any considerable extent previously to death, otherwise the circulation could not have gone on, the phenomenon being produced by the increased irritability of the coats of the arteries and by their constriction on exposure to the air. It was supposed by Dr.

Cullen and others that the constipation always observed previously to the accession and during the course of the disease is owing to spasm of the muscular coats of the digestive canal; but there is no pain or other symptom referrible to this quarter suggestive of spasm, obstinate constipation generally attending all severe maladies of the nervous centres of animal life, as shown when treating of diseases of the Brain and Spinal Cord.

15. 2d. Sleep rarely occurs in acute traumatic tetanus, and only during a few minutes, or in the intervals between the exacerbations, or when the continued contractions in these intervals are not attended by much pain. In the sub-acute cases, however, sleep is more frequent, and a more complete relaxation of the muscular contraction takes place, but, upon being awakened, the full tension of the muscles returns. This circumstance shows the influence of loss of consciousness upon the morbid irritability of these cases, and throws some light upon the pathology of the disease (see § 61, *et seq.*). During recovery, and in the less severe cases, and when the intervals between the paroxysms are considerable, sleep may ensue, and the spasms be relaxed, especially as then the effects of the narcotics, so frequently prescribed for the disease, begin to be manifested.

16. *c.* The *pulse* in tetanus has been variously described by different authors. This has been owing chiefly to the different states of the heart's action in the several stages or states of the disease, and the varying grades of frequency in the acute and sub-acute cases, as well as in the idiopathic and symptomatic forms of the malady. Dr. Morrison, Hennen, Macgregor, and others have remarked that the pulse is seldom much affected; but the greater number of writers have stated the pulse to be very much accelerated, and most remarkably so in acute cases. This is the result of my own observation in the numerous cases which I have had an opportunity of observing in France and Germany, in 1815 and 1816, and subsequently in warm climates. In an acute case which I attended in 1820, the pulse was 120 in the minute in the first day of the developed attack. The patient died on the third day. The pulse is generally much less frequent during the intervals than in the paroxysms, but the degree of frequency varies in different cases, as well as in the course of the disease. The treatment adopted has often a considerable influence in quickening the pulse, and towards a fatal issue this is especially the case. The changes taking place in the spinal cord, medulla, &c., and their membranes, according to their nature and amount, also influence the pulse. As the powers of life sink, or are depressed by sedative agents, as by tobacco injections, &c., the pulse becomes remarkably quick, and often feeble. Both the pulse and the respiration are greatly accelerated by the spasms, and hence are varied in character and in quickness with their severity and frequency of accession. During their continuance, especially towards the close of the malady, the pulse is often so frequent, weak, and irregular as not to admit of being accurately counted, while the respiration is laboured or gasping.

17. *d.* The *surface* of the body is much warmer than natural, is bathed in perspiration, and is often morbidly sensitive to external agents. The amount of animal heat necessarily varies in different cases—probably from 100° to 106° of Fahr. M. Prévost, of Geneva, has stated it to have been much higher (110°) in a case under his care. Dr. Bright says that it was 105° on the third day of the disease. I observed it 105½° in the axilla on the second day of a case which terminated fatally on the fourth day, and 106° in another which died on the third day. The perspiration is most copious during the exacerbations, and generally has a pungent and peculiar smell. Larrey supposed it to be critical, but Mr. Curling justly considers this not to be the case. I have seen it the most abundant in the most rapidly fatal cases. A miliary eruption sometimes accompanies excessive perspiration and heat of the skin. The cutaneous sensibility is unusually great, especially to the slighter causes of sensation, as to a light touch, to cold air, &c., and in this the disease resembles the sensitiveness of the surface in Rabies, and in inflammation of the spinal membranes (see Spinal Cord, § 135).

18. *e.* The *urine* is generally in small quantity in tetanus, as may be supposed from the excessive perspiration, and it is usually high-coloured. It is more abundant in the sub-acute form of the malady. The bowels are always constipated, and are moved with great difficulty; the stools, however, present no very remarkable disorder beyond what is usual from retention. The tongue is commonly white and moist at the commencement, but it is often dry, with the papillæ erect as the disease advances, and thirst becomes urgent. When tetanus or trismus is fully developed, the tongue can seldom be satisfactorily shown.

19. *f.* The *senses* are acute during the course of the disease, especially sight, hearing, and touch, and are remarkably susceptible of their respective stimuli. The functions of the *mind* are unimpaired, even during the most distressing exacerbations, and any degree of delirium is rarely observed until shortly before dissolution, and then it may sometimes have been occasioned by the narcotics which had been prescribed.

20. *g.* The state of the *blood* has not been satisfactorily observed, either in the idiopathic or symptomatic form of the disease. I have seen it without any particular change in one case, and both cupped and buffed in another, and slightly cupped only in two; but one of these cases was only once accidentally seen by me. The question is, whether or no this state of the blood is connected with, or a manifestation of, inflammatory action in the animal nervous centres, or merely the consequence of the inordinate muscular action; but this involves the consideration of the pathology of the disease. Admitting that there is inflammatory action of these centres, or at least of their envelopes, in some cases, as there undoubtedly is in the idiopathic states of the malady, there must necessarily be some degree of fever, and this state of the frame is said not to exist in traumatic tetanus. Mr. Curling observes that this form of the malady "is generally unattended by fever; and Dr. Cullen, Dr. Clephane, and Dr. Chalmers, and many other authors, have remarked that the blood very rarely possesses an inflammatory character." Mr. O'Beirne states that he witnessed about two hundred cases of tetanus, but he never saw one accompanied with fever. It may certainly be admitted that, in the traumatic form of the disease, fever is not often observed at its commencement, and that the feb-

rile symptoms enumerated above, especially the quick pulse and respiration, the hot skin, the copious perspiration, thirst, and excited papillæ of the tongue are chiefly the consequences of the violence of the muscular contractions; yet in many cases these symptoms (if not febrile, what are they!) are partly to be imputed to increased vascular action—an action excited by the irritation propagated to the spinal cord and medulla oblongata, and thence reflected upon the voluntary muscles, the inordinate action of these muscles developing increased vascular determination to the origins of the spinal nerves and to the spinal cord; this determination, advancing to morbid action, perpetuating the muscular contractions, extending their spheres, and ultimately terminating, in very many instances, by implicating the respiratory muscles, even the muscles of the glottis as well as those of the pharynx.

21. *B.* Sub-acute and other States of Tetanus.—When an attack of either idiopathic or symptomatic tetanus is less severe than that described above, especially during the second and third days, or when its severity is partially subdued, it may continue in a sub-acute or milder form for several days, or even for three, four, or five weeks. This state of the disease has been usually termed *chronic*, but it hardly can be called so as respects either the character or duration of the disease. In this less acute or milder form the symptoms are nearly the same as in the acute, especially at an early period, but they either are or become less severe. The intervals between the paroxysms are longer, and the paroxysms are shorter, or the spasms are milder. The pulse, also, is either less frequent or but little accelerated during the intervals, and the contractions are less general or continued than in the acute form. The symptoms thus gradually subside, and the natural functions assume their healthy states; but the muscles continue for some time stiff or sore, and they are liable to a return of stiffness or contraction after exposures to either cold, wet, or miasmatous exhalations.

22. *The sub-acute or mild form* of tetanus may present an intermittent character, especially when it is idiopathic, owing to the concurring influence of malaria with wet and cold in causing the attack; but this modification of the disease is only met with in warm climates and in miasmatous localities. In females, trismus or sub-acute tetanus may assume an *hysterical character*, or hysterical symptoms may be associated with the tetanic, the disease being really tetanus, and occasioned by an injury. Of this association I had a very remarkable instance, many years ago, in a cook in my own family. This state of the disease should be distinguished from hysteria, when the latter assumes a tetanic form, owing to the violence of the spasms during the hysteric paroxysm (see Diagnosis, § 35).

23. But tetanic symptoms may be produced in females by the usual causes of tetanus, especially during the catamenia, or after an abortion, or after parturition, especially if any portion of the ovum, or membranes, or placenta be retained. In these there is sometimes much of the hysterical character, but the tetanic may so predominate as to place the patient's life in jeopardy. Of this I saw a case to which I was called in consultation some years ago. I was convinced of the retention of a portion of the ovum. A decoction of secale cornutum with the biborate of soda was prescribed, terebinthinate enemata were administered, and terebinthinate embrocations applied along the spine. The cause of irritation was discharged from the uterus, and the patient recovered.

24. *C.* Terminations.—A *fatal issue* is most commonly occasioned as now stated. In this case the paroxysms become more severe and prolonged, and the pulse most frequent, feeble, and irregular. Respiration is difficult, hurried, laborious, and unequal. The motions of the chest and of the diaphragm are impeded, and the lips, face, and surface become first pallid and then livid. The lungs are congested, and air ceases to be either inhaled or expelled. It has been supposed that, during the paroxysm, asphyxia may be occasioned by spasmodic closure of the glottis, the spasms extending to this quarter chiefly or only, and that death is thus suddenly produced during the exacerbation; and it has also been inferred that spasmodic closure of the glottis is superadded to spasm of the muscles of the chest and diaphragm. Whether either mode takes place solely, or both co-operate in occasioning the fatal result, is a matter not easily determined; but it is of some importance that it should be ascertained, as indicating an extreme measure of treatment in imminent circumstances. While death is thus generally occasioned in the acute cases, it is imputed chiefly to exhaustion in the sub-acute, or chronic, as commonly termed—the prolonged disease, the inability to receive nutriment, the return of spasms, and the consequent exhaustion and inanition terminating life. But even in these spasm may affect the muscles of respiration, or even the glottis, and produce death. When exhaustion or inanition occasions this termination, the paroxysms become weaker and less frequent, the pulse small, weak, irregular or intermittent; the muscles relax, the features sink, the eyes are dim, or are covered by a slight film, and respiration is gasping, slow or laboured, or it gradually and almost insensibly ceases.

25. Recovery from tetanus is commonly gradual. In a table where Mr. Curling has arranged 128 cases of traumatic tetanus, fifty-eight terminated successfully, eight being cured in the course of a week, three in ten days, four in a fortnight, four at the end of three weeks, fifteen at the end of a month, four after five weeks, eight after six weeks, three at the end of eight weeks, three after two months, and two after three months. The muscles often continue stiff for some weeks after the spasms have subsided, owing to the injury received by them during the attack. Even months may elapse before they regain their healthy tone and action. In a case recorded by Dr. Currie, the patient's features retained "the indelible impression of the disease." And in a case by Mr. Curling, the patient complained of stiffness about the jaws when exposed to cold, although nine months had elapsed from the attack; and in another case, rigidity of the muscles of the lower jaws continued for six months after recovery. A few days before this was written I was consulted by a gentleman, whose jaws had continued so firmly locked, after an attack of idiopathic trismus, that some of the front teeth had been extracted to enable him to receive food into his mouth. This contraction of the muscles of the jaws had continued nine years without any change. He had become accustomed to it, and he now consulted me for a different ailment. The

treatment of these effects of tetanus is a matter of importance, as will appear in the sequel.

26. *The duration of tetanus* varies very remarkably, both in the idiopathic and symptomatic forms. This is well shown, as respects the latter form, by the table compiled by Mr. Curling. Professor Robison has stated that a negro, having scratched his thumb with a broken piece of china, was seized with tetanus, and died in a quarter of an hour. In one case the patient died in twelve hours; in another, recorded by Mr. Dickinson, death took place in twenty-two hours; and in a case contained in Mr. Curling's table, in twenty hours. In another, fully detailed by this excellent writer, death occurred sixteen hours after the first appearance of tetanic symptoms, and six days after the injury. This termination is frequent at various periods from twenty-four to forty-eight hours. In the table just mentioned, fifty-three cases were fatal within eight days after the appearance of symptoms: eleven on the following day, fifteen on the second day, eight on the third, seven on the fourth, three on the fifth, four on the sixth, three on the seventh, and two on the eighth day after the commencement of the disease, but very few after a longer period. Morgagni mentions a case which was fatal after twenty days. Dr. Lionel Chalmers, in his account of acute idiopathic tetanus in South Carolina, assigns the duration of this form of the disease nearly to that of the traumatic form now quoted from Mr. Curling. Dr. L. Chalmers states that patients generally die in twenty-four, thirty-six, or forty-eight hours, and very rarely survive the third day; but when the disease is less acute, that few are lost after the ninth or eleventh day.

27. *D.* Appearances in Fatal Cases.—Different changes have been observed in different cases, and those which have been found in some have been absent in others. Certain changes are, however, more constant, and are rarely altogether absent.—*a.* The *body* generally is unusually rigid after death; and the *muscles* are not only firm or contracted, but they also present, in many places, rupture of their fibres and ecchymoses.* The *blood* is always uncoagulated, and hence it gravitates to the more depending parts, and gives those parts externally a livid or dark mottled hue. The combination of rigidity of the muscles with fluidity of the blood shows that the *rigor mortis* is not the result of the coagulation of the blood in the structures; this state of the muscles being evidently owing to the morbidly increased irritability before dissolution, the remains of which still continue in their fibres for some time after death.

28. *b.* The *nerves* immediately connected with the seat of injury are stated by some writers to have been injured, inflamed, or otherwise changed; and by others to have been in no ways affected. Even when presenting manifest appearances of inflammation, they have been viewed as merely participating in a similar state of the surrounding parts. In some cases, however, the inflammatory changes have not been confined to the portions of the nerves in the seat of injury, but have been traced in different parts of their course as far as their origins. Many recent observers have traced these changes along the nerves to the pia mater, the arachnoid, and the substance of the spinal cord, which have usually also presented evidence of inflammatory action. Some instances have occurred to these and other observers (see Biblioo. and Refer.), in which injury of the nerve has existed, or causes of irritation have been in contact with the nerve, without signs of inflammatory action. As respects the nerves, therefore, the proofs of change, although evident in many instances, are wanting in others; but it is by no means certain that, although changes perceptible to the unaided senses have been wanting, no change has existed, or that irritation of a most violent kind may not have been propagated along the nerves without developing inflammation, or changes usually termed inflammatory, sufficiently great or manifest to remain many hours after death.

[We have, in several instances, found tumefaction and reddening of the nerve, extending from the wound to the spinal cord, after death from tetanus, which we have never observed in cases where no tetanic symptoms had occurred. M. Pelletier has also published several cases (*Revue Medicale*, 1827, vol. iv., p. 183) where he observed the inflammation propagated along the injured nerve in this disease. Froriep has noticed the same phenomenon in seven cases of tetanus, and regards it as a uniform and characteristic lesion. There is certainly no uniformity in the post-mortem appearances in the central organs of the nervous system in tetanus, and there is no uniform lesion, unless it be that of the nerve above mentioned. In examining for this lesion, it must be recollected that the neurilematous sheath is the part mainly affected in inflammation, presenting an increase of redness, more or less intense; the infusion of serum inducing a fulness and swelling of the nerve, causing the nerve-tubules themselves to become separated, and, as it were, unraveled. This is often followed by exudation of fibro-plastic matter, and compression of the fasciculi, thus causing their obliteration.]

29. *c. The ganglia and sympathetic nerves* were suggested by me, in a paper published in the *London Medical Repository* for May, 1822, to be the seat or pathological cause of tetanus, and especially of the idiopathic form of the malady. I then contended that the ganglial, or the organic nervous system, is the source of irritability in contractile tissues; and when this property is inordinately excited without the control of the will, that changes should be looked for in this system. Some years subsequently, Mr. Swan directed attention to the sympathetic system in tetanus, and stated that the ganglia were preternaturally injected in this disease; and appearances said to support this statement were observed by Andral, Aronssohn, and Dupuy; while Meyer, Vetter, [Bright], and others have adduced instances of tetanus consequent upon ossific deposits irritating branches of ganglial nerves. It should not, however, be overlooked, that the ganglia are often

* Mr. Bowman (*Philos. Transact.*, 1841, p. 69) has found some muscles in tetanus apparently healthy, while others presented a pale appearance in many parts, like the muscles of fish, owing probably to the blood having been squeezed out of the vessels. In other parts they had almost lost their fine filamentous structure, and presented a soft spotted mass which was easily torn. Extensive ecchymoses were frequent, and contrasted with the pallor of other parts. Under the microscope, the primitive fasciculi exhibited here and there the characteristic signs of extreme contraction, fusiform swelling, and a closer approximation of the transverse striæ than usual. In other parts, these fasciculi were reduced in size, and the striæ were either far apart or had disappeared entirely. In many parts they had burst with the sheath.

very vascular, even in health; that they are not always, or even generally, unusually or excessively vascular, and much less manifestly inflamed in tetanus; and, even granting them to be excessively injected or inflamed, it cannot be shown that their inflammation could be more productive of tetanus than a state of irritation or of vascular erythism, this latter condition being manifestly more compatible with excessive discharge of function than a state of inflammation.

30. *d. The Spinal Cord, Medulla Oblongata, Brain, and their Membranes*, have frequently presented changes, more or less decidedly morbid, in tetanus and trismus. I believe that these changes are rarely altogether absent, especially as respects the spinal cord, medulla oblongata, the pons Varolii, and their membranes, when the inspection is made within twenty-four hours after death, and when these parts are carefully examined. Something, however, should be imputed, as respects both the presence and the absence of change, to the fluidity of the blood after death, and to the position of the body. In no inspection which I have witnessed have inflammatory appearances in one or other of these parts been altogether wanting. These appearances have been viewed as the pathological cause of tetanus by the FRANKS, LARREY, MAGENDIE, BRERA, RECAMIER, REID, KENNEDY, OLLIVIER, CASTLEY, and many others, whose writings are referred to in the BIBLIOGRAPHY; and when tetanus or trismus has been present, and these changes have been slight or absent, the circumstance may be explained without inferring that these parts were either unaffected or unchanged, even in their vascular conditions during life (see § 63, *et seq.*). The changes more commonly observed are, vascular injection of the pia mater, sometimes with exudations of lymph on its free surface; hardening or softening of one or more of the columns of the cord or of the medulla oblongata, softening being more frequently observed when the inspection has been long delayed; opacity of the arachnoid, or deposits of small plates of bone or of cartilage in the free arachnoid, the surface of these plates being rough on the sides next to the pia mater; generally increased vascularity, sometimes with recent adhesions, and congestion of the veins and veinous sinuses of the spine. These changes may extend more or less generally along the cord and medulla oblongata, often also to the pons Varolii, and even to parts in the vicinity of the latter, and surrounding the fourth ventricle. They were thus observed, with several ossific plates in the arachnoid, in an acute case of tetanus which was under my care in 1820, and of these appearances I made a coloured drawing, which is still in my possession.

[We find that in tetanus the equilibrium of the forces, whose balance is necessary to the due performance of the functions of the nervous system, is destroyed, and it is quite compatible with our knowledge of pathology and physiology that this should occur without any primary change in the circulating organs, while, on the other hand, we are equally justified in assuming that a state of congestion and inflammation may react upon the nervous system in such a manner as to entirely alter its normal relations—so that we may view the morbid appearances in the vascular system, either as the cause or the result of the changes in the nervous system.]

31. In addition to these, the substance of the cord and medulla is somewhat reddened or injected, and exhibits numerous red points when divided. In some cases the membranes are more decidedly inflamed and thickened. Generally the spinal fluid is abundant and somewhat altered or turbid. In rarer instances, a puriform exudation is found between the membranes, and the softening of a portion of the cord presents a puriform infiltration with capillary injection. In still rarer cases, the serous exudation is of a rose colour, or even more deeply tinged, or even blood is extravasated and extended along a considerable part of the cord. These are the chief changes which are observed in the spinal medulla in fatal cases of tetanus; but nearly all the appearances described when treating of *inflammation of the membranes and substance of the* SPINAL CORD and MEDULLA OBLONGATA are sometimes found in cases of tetanus and trismus, especially in the idiopathic form; while in some cases, more particularly of the traumatic form, no changes in the spinal cord, medulla oblongata, or their membranes, or in the ganglial nerves, or even in any other part, have been detected; but whether the examination in these instances has been sufficiently minute or not, may be viewed, in the present state of our knowledge, as somewhat doubtful.

[It should be recollected that position is more likely to affect the spinal cord than the brain, owing to its being less excluded from atmospheric agency; and also that the relation of the envelopes of the cord differs from that existing between the investments of the brain and their contents in various material points. Mr. CURLING has called attention to this circumstance, and relates a case of tetanus where, on examining the body *post mortem*, which had been placed on its face immediately after death, he found that part of the pia mater covering the anterior columns of the spinal cord remarkably vascular, while in three other instances of the same disease he found the vessels in the posterior parts only turgid. From several similar observations, Dr. C. infers that the vascular condition of the spinal cord in tetanus is chiefly a post-mortem phenomenon.]

32. The morbid appearances which have been constant in the cases which I have inspected, chiefly, however, many years ago, were, injection of the membranes and substance of the more central parts of the base of the brain—the medulla oblongata, the pons Varolii, and parietes of the fourth ventricle. Numerous cases illustrative of the pathology of tetanus have been detailed by Mr. CURLING; and to his work, as well as to others, and to many interesting papers referred to in the BIBLIOGRAPHY, I refer the reader.

33. The changes which have been found in these parts of the animal nervous system admit of more than one interpretation, and manifestly supervene in two ways: 1st. They may be induced primarily, especially in idiopathic tetanus. the seat and extent of the inflammatory action along the medulla oblongata and cord, occasioning the extended and the continued contractions, and the spasmodic exacerbations. 2d. They may be merely consequences of the irritation conveyed to the spinal medulla and membranes, or to the medulla oblongata, or parts in its vicinity, by nerves proceeding from the periphery of the frame, or by communicating nerves from internal ganglia or viscera; the irritation thus extended

and reflected by motory nerves on the voluntary muscles, excites increased vascular action; and this increased action in many instances advances to inflammation, or to the production of changes, either resembling or identical with those said to be inflammatory. (See *Pathological Inferences*, &c., § 61, *et seq.*)

34. *c.* In addition to the above, changes have been found in other parts of the body. The *lungs* are usually congested, and the blood in the vessels is dark and fluid, owing to the immediate cause of death—the state of asphyxia. Increased vascularity or inflammatory injection of the digestive *mucous surface* has also been seen by M'ARTHUR, SWAN, ANDRAL, and others; but this change may also have resulted from the asphyxia, or from the medicines prescribed. Injection of the *ganglia* has been remarked by SWAN, myself, and others; but this, if it at all exceed the natural state, may be only the result of propagated or transmitted irritation. The existence of *worms* in the intestines and stomach in a very large proportion of cases, of both the idiopathic and symptomatic malady, especially the former, is interesting, at least as a predisposing cause; and instances of this fact have been recorded by MURSINNA, O'BIERNE, LARREY, LAURENT, DAZILLE, THOMPSON, MORGAGNI, STOLL, and many others; and great importance has been attached to them as a cause of tetanus by these writers. "The papillæ maximæ at the root of the tongue are sometimes found hypertrophied, and the mucous lining of the *larynx* highly injected, and containing a quantity of frothy mucus."—(CURLING.) The *pharynx* and upper portion of the œsophagus are much contracted, and their internal surface is red and inflamed, and often covered with a viscid reddish mucus. Similar appearances are also found in cases of RABIES (see § 22). In both maladies the spasms of the pharynx explain the changes of these parts.

35. II. DIAGNOSIS.—Tetanus can hardly be mistaken for any other malady.—*a.* The continued contraction of the muscles of the jaws and face, the peculiar pain under the sternum, and the exacerbations of the continued muscular contractions, viewed in connexion with the cause, when this is known, sufficiently indicate the malady.—*b.* It may, however, when superficially viewed, be mistaken for *rabies* (or hydrophobia, as that malady has improperly been termed), owing to the difficulty of swallowing fluids, to the accession of spasms of the muscles of the face and neck upon attempts to swallow, and to the increased sensibility. But the entire absence of muscular contraction during the intervals between the paroxysms, and the morbid impulse and ferocity characterizing the rabid paroxysms, distinctly mark that disease, and distinguish it most satisfactorily from tetanus.

[In some cases of tetanus, guttural spasms occur on attempting to drink, and there is the same dread of fluids, and their rejection, as in hydrophobia. But in tetanus there is rarely a discharge of saliva, which is so common in hydrophobia; and thirst is as rare in the former as it is common in the latter. In tetanus, also, the mind is generally clear to the last, while hydrophobia is marked by more or less mental aberration. There is also a marked contrast in the expression of the countenance in the two diseases, and tetanus scarcely ever presents the laborious, panting respiration, the tremour of all the muscles, and the great sensibility of the surface and organs of sense which occur in hydrophobia.]

36. *c.* Tetanus can hardly be distinguished from *inflammation of the membranes of the spinal cord and medulla oblongata*, especially idiopathic tetanus. Indeed this latter, and even the symptomatic, may be viewed as often being very acute forms of inflammation attacking almost simultaneously the arachnoid and pia mater of the cord and medulla oblongata, and occurring either primarily or consecutively of irritation propagated to these parts (§ 33), the extent of the morbid action occasioning a co-ordinate extent of muscular contraction. When treating of meningitis of the cord, and of myelitis (*see* SPINAL CORD, § 127–157), I described the symptoms, as respects the voluntary muscles, as being identical with tetanus or trismus, according to the seat and extent of disease of the spinal membranes. Inflammation attacking either these membranes, or the cord, or the medulla oblongata, or extending to them all, will necessarily be followed by effects, as respects the muscles especially, varying with the changes produced in these structures by the inflammatory irritation or action, of which they are either successively or coetaneously the seats. For, if the morbid vascular action in these tissues be not followed by either effusion of lymph, or softening of the cord so as to occasion abolition of function (paralysis), it must necessarily follow that the increased muscular action, produced by the vascular action in the membranes of the cord, will be continued either until the vascular action subsides or is subdued by treatment, or until it extends to the membranes or substance of the medulla oblongata and central parts of the base of the brain, and occasions spasm of the respiratory muscles and asphyxia. In many cases the inflammatory action in the membranes or substance of the spinal cord is limited to a portion only of either, or of both, and the consequent changes are such as occasion paralysis, the tetanic contractions described, in the article referred to, being partial and co-ordinate with the extent of disease in the cord, and either preceding the paralysis or coexisting with paralysis, but in a different series of muscles. Instead, therefore, of viewing tetanus and trismus, especially in their idiopathic forms, as totally different diseases from inflammation of the membranes of the spinal cord and medulla oblongata, I consider them very closely allied, although not identical maladies, the chief differences arising from the extent to which these membranes are affected, from the development of muscular irritability being greater in the one disease than in the other, and from the changes consequent upon the irritation or inflammatory action of which they are the seats.

37. *d.* It ought not to be overlooked that *Hysteria*, especially in its more paroxysmal and spasmodic form, may very closely simulate one or other of the forms of tetanus. Of this I have observed several very remarkable cases, the closeness of resemblance being such as would have induced a physician, who had seen the case for the first time, to believe that the patient was actually the subject of tetanus. Generally, however, these hysterical tetanic seizures are preceded and attended by so many hysterical phenomena that the difficulty of diagnosis is slight. But this is not always the case; for the trismus, or the more general tetanic contractions, may be so protracted, and the symptoms of either opis-

thotonos or emprosthotonos be so complete as to lead to the conclusion, which the observation of some cases has confirmed, that the irritation of the sexual nerves has so excited the spinal cord or membranes, or the origins of the spinal nerves, as to develop a tetanic state, owing to the reflection of this irritation from the cord and origins of the voluntary nerves upon the muscles of voluntary motion. The nature of these hystero-tetanic seizures, even when prolonged, may be inferred from the sex and age of the patient, from the history of the case, from coexisting hysterical symptoms, and from the rapid effect produced by influences acting strongly on the mind, or powerfully exciting volition, as preparations to apply the actual cautery or the cold affusion. It may farther be mentioned, that cases may occur (I have seen three undoubted instances) of simulated trismus or tetanus in hysterical females, especially in those who addicted themselves to self-pollution. The test just mentioned will often aid in the detection of these cases, and often present the recurrence of the hysterical form of trismus or tetanus. The trismus, or more fully developed tetanus, occurring in rare instances after parturition or abortion, is often attended by hysterical symptoms, and hence requires close attention to distinguish it from some states of hysteria, the alliance in such cases being close. Although *epilepsy* is attended both by trismus and tetanic spasms, yet the characteristic unconsciousness of the former sufficiently distinguishes it from the latter.

[Prof. Simpson, of Edinburgh, maintains that traumatic tetanus sometimes supervenes as a secondary obstetrical disease; regarding the interior of the uterus, after abortion and parturition, as in a state of lesion similar to that of a wound on the external parts of the body. The reason why the separation of the *decidua* does not more frequently give rise to tetanus, he believes to be found in the fact that the uterus is chiefly supplied by nerves from the sympathetic system, whereas tetanus, being chiefly a disease of the true spinal system, is produced by irritation of nerves immediately connected with that system. As Dr. Simpson holds that *eclampsia*, or puerperal convulsions, is generally produced by the existence of a morbid poison in the blood, so he deems it probable that the generation of a special blood-poison, at the site of the wound or elsewhere, may give rise to surgical or obstetrical tetanus, just as the presence of strychnia in the blood gives rise to tetanic spasm. Out of 24 cases of obstetrical tetanus recorded by Prof. Simpson, only three recovered, and these under opposite modes of management. Indeed, there are but very few cases on record of recovery from this rare affection. The principles of treatment applicable to it are the same which regulate the management of other forms of the same disease. Dr. D. H. Storer, of Boston, has recorded a fatal case of tetanus following a retained placenta (*N. Y. Lancet*, vol. i., p. 62), and other similar cases have been reported.

Dr. Colles, of Dublin, thinks that two distinct diseases have been confounded together under the name of tetanus. That which is often mistaken for it comes on after injuries, and especially fractures. We have seen two cases, in hysterical females, from pricking the finger with a needle. The spasms which so often occur in the muscles of a fractured limb, from the irritation caused by the sharp spiculæ of bone, or the want of support, or of points of resistance to muscular action, and which come on immediately after the receipt of the injury, are never a formidable affection, and seldom continue beyond the second or third day. But another and frequently fatal form of spasmodic disease occurs about the third or fourth day after the injury, generally terminating in death by exhaustion between the second and sixth day from its invasion. The spasms, commencing in the injured limb, and recurring at irregular, but increasingly frequent intervals, at length extend to the muscles of the body (at first confined to the injured side), then gradually involve all the muscles of the body, which are distorted in a fearful manner. It is distinguished from true tetanus, according to Dr. Colles, by its occurring in three or four days after the accident, while the latter seldom appears before the second or third week. It begins by spasm in the limb injured; true tetanus by stiffness of the throat. In the intervals between the spasms in the former, the muscles are quite relaxed, and the patient can swallow and move with comparative ease; while in tetanus there is constant rigidity, almost preventing swallowing or motion of any description, and giving the peculiar expression of countenance. In the former the pain is chiefly in the wound, and is most severe during spasm; in the latter there is no pain in the wound, but a pain, not very severe, at the scrobiculus cordis. It also runs it course in three or four days, while tetanus may continue (says Dr. Colles) for as many weeks. In it amputation holds out the only prospect of relief; while in tetanus amputation is perfectly useless, if not injurious. Such, according to Colles, are the essential differences between these two forms of spasmodic affection, and which are so generally confounded.]

38. III. Tetanus Infantum.—Synon.—*Tetanus vel Trismus Nascentium; Tet. vel Tris. Neonatorum; Tet. or Tris. of new-born Infants.—The Tetanus* or *Trismus* of recently-born infants is essentially the same disease as that already described. It generally commences in the first seven or nine days after birth, and rarely later than the fourteenth day. The muscles of the lower jaw are first affected, hence it has been frequently named trismus; but the spasms are rarely limited to these, but commonly extend to the other muscles of the face, and to those of the neck, trunk, and also of the limbs. Even when the spasms are apparently confined to the muscles of the jaws, a paroxysm of more general spasm suddenly occurs and terminates life by asphyxia. The tetanus of infants usually presents two forms, as in the tetanus of adults, but is even more rapid in its progress than the latter—the *acute*, which commonly terminates life in ten or thirty hours, or within forty-eight hours; the *sub-acute*, which may be prolonged to eight or nine days, but more frequently terminates from the third to the fourth or fifth. Recovery from either of its forms is very rare.

39. This malady is now very rarely observed in temperate climates, and formerly not frequently, unless in Lying-in-Hospitals, in which it has appeared as a most fatal endemic. According to Dr. Joseph Clarke, it proved fatal to many of the infants born in the Dublin Lying-in-Hospital. At the conclusion of 1782, of 17,650 born alive in that institution, 2944, or about 17 per cent., had died of it within the first fortnight from birth. But it is chiefly among the dark races, and the

negro slaves especially, that it is most frequently met with. Mr. MAXWELL, Dr. HANCOCK, Dr. MORRISON, and others state that it is a chief cause of depopulation in the negro races in the West India Isles, and in the colonies of Demerara and Essequibo, the deaths of new-born infants from this malady being about cent. per cent. of all that are born. According also to RUSH, FOURCROY, VALENTIN, DAZILLE, CAMPET, and others, it is also a frequent, and always a fatal, disease in the Southern or Slave States of the United States, but that it is rarely seen in white infants. According to Dr. HOLLAND and Sir GEO. MACKENZIE, it is destructive to all the infants born in the island of Haimacy, on the south coast of Iceland, and it exists in St. Kilda, the most remote of the western islands of Scotland; this prevalence being imputed chiefly to the food given to infants.

40. *The causes* of this disease of infants have been very differently assigned by writers. By some it has been imputed to the division of the umbilical cord, and to the subsequent treatment, and hence it has been viewed as traumatic tetanus in the infant; by others it has been considered as idiopathic, and caused chiefly by a vitiated atmosphere, from crowding and deficient ventilation; and by many it is said to be owing to the retained meconium, and to morbid secretions in the prima via; while not a few impute its frequent occurrence in the West Indies to the excessive use of irritating purgatives soon after birth. All these causes have been disputed, and exposure to cold, or currents of air, has been assigned as its chief agent. That more causes than one are concerned in producing it seems most probable, and, in connexion with the division of the umbilical cord, an impure air, currents of cold air, unwholesome and inappropriate nutriment, and irritation of the digestive canal either by morbid secretions and excretions, or by unsuitable purgatives, may concur in developing the malady, in those constitutionally predisposed to it, as negro infants appear to be, especially in some localities. That a contaminated atmosphere is concerned in causing the malady in white infants, is shown by the fact that the very remarkable fatality occasioned by it in the Dublin Lying-in Hospital, and noticed above (§ 39), was reduced, after the date there stated, from seventeen per cent. to five per cent., by a better ventilation of the institution.*

41. *The appearances in fatal cases* have been very differently described. But although nearly every case has been fatal, and numerous opportunities of inspection have been furnished, still the changes produced by the malady have been very imperfectly observed. Until early in the present century the spinal cord and parts in the vicinity of the fourth ventricle were rarely or never examined, even in this and other forms of tetanus; and as various concomitant or contingent changes were remarked by writers in different tissues and organs, so these changes severally received the credit of directly or pathologically producing the disease. Various changes of an inflammatory kind have been observed in parts in the vicinity of the umbilicus; while several of these changes have been considered such as necessarily follow the division of the cord. Dr. GOELIS, of Vienna, was among the first to examine with attention, although preceded by the FRANKS, the spinal cord and medulla oblongata, in the cases which occurred in the foundling hospital of that city; and he, as well as others subsequently, has always observed increased vascularity of the membranes and substance of those parts of the animal nervous centres. Indeed, according to my own observations in a few instances, and to those of other writers who have always inspected these parts, not only in cases of trismus and tetanus, but also in fatal cases of epilepsy and convulsions, morbid appearances, either congestive or inflammatory, and often also their usual consequences, have been observed in these situations, and in the more central parts of the base of the brain, and hence we have no reason to infer that the pathology of the tetanus of new-born infants is in any material respect different from that of the tetanus of adults, the only difference being in the greater severity, acuteness, and fatality of the former; and, as far as my own observation has extended, in the more marked inflammatory appearances, or the extremely increased capillary injection of the nervous centres of both organic and animal life.

42. IV. RELATIONS AND ALLIANCES OF TETANUS AND TRISMUS TO OTHER DISEASES.—i. Certain of these *relations* have been already noticed when noticing the *Diagnosis* of tetanus and trismus, but there are others which should not be overlooked, especially as they serve to throw light on the nature and treatment of this malady. When treating of inflammation of the membranes of the BRAIN and of the SPINAL CORD, I stated that spasm, more or less constant or persistent, is present in the muscles supplied with nerves, the origins of which are more immediately connected with the inflamed part, and that the spasm continues until pressure or disorganization, at the origins of these nerves, destroys their functions. When irritation is propagated from remote or distant parts to the membranes of the cerebro-spinal system the effect produced may be longer persistent, than when inflammation is primarily developed in these membranes; for, in the former case, the irritation may continue long before inflammation is developed, while in the latter the primary existence of inflammation may be more rapidly followed by exudation, thickening, and other inflammatory changes calculated to impair or destroy the functions of their seats and of adjoining parts. Hence in most cases of spasm, convulsive disease, and tetanus, the nature and rapidity of the fatal result depend either upon the extension of the irritation to parts intimately connected with the origins of nerves supplying vital parts, or to the inflammation and consequent changes at or near the origins of these nerves.

43. *A.* In *cerebral* or *spinal Meningitis* there is generally spasm of muscles supplied by nerves,

* [In the West India Islands and our Southern States, a large proportion of new-born infants die during the first fortnight. This mortality is ascribed to a variety of causes, such as want of cleanliness and ventilation, and sudden and frequent changes of temperature, &c. In the northern parts of Europe the same affection is common, especially among Jewish children, and is attributed to the same causes. The disease is also very prevalent among the western isles of Scotland and on the southern coast of Iceland, where fish and the eggs of sea-fowl constitute the sole food of the inhabitants. There can be no doubt that constitutional and hereditary causes may also be influential in predisposing to the disease, as well as that of locality. It must be acknowledged, however, that we are not as yet well acquainted with all the causes which predispose to or excite this fatal malady. Messrs. COLLES, BUSCH, and LEVY attribute trismus in the new-born infant to inflammation of the umbilical arteries, while Dr. WOOTEN and others ascribe it to irritation in the umbilical cord, from bad management.]

the origins of which are allied to the irritated or inflamed portion of membrane; and, when the membranes of the basilar parts of the brain are affected, the spasms are the more general and severe or fatal. In the convulsive or spasmodic affections of infants or children, the great difficulty often is to determine whether the attack proceeds from disease existing primarily in the brain or its membranes, or from irritation and consecutive morbid action propagated thither from distant or remote parts; and even when the latter is most evidently the case, it is not the less difficult to decide how far the propagated irritation may have affected the membranes or substance of those parts of the cerebro-spinal centre to which it had extended. The spasmodic attacks of infants and children, whether tetanic or convulsive—whether persistent or momentary—generally depend upon certain pathological conditions, which are usually simple, or unassociated at their commencement, but which are not unfrequently complicated in their advanced progress. These conditions may be—1st. Irritation or vascular erythism in, or implicating, the more central parts of the base of the brain, or of the membranes. 2d. A similar state affecting some portion of the spinal medulla. 3d. Inflammatory action, at an early period of its progress, or before the consequent organic changes have abolished the functions of the nerves proceeding from the seat of morbid action in either the brain, or spinal cord, or their membranes. 4th. Irritation primarily affecting some portion of the digestive canal, and propagated thence to either the cord, or brain, or their membranes. 5th. Irritation existing in the gums, or in other parts more or less remote and similarly propagated. 6th. Morbid states of the blood, arising either from the absorption of morbid matters, or of poisonous articles, or from self-contamination, consequent upon the failure or arrest of some depurating function, and affecting the substance or membranes of the cerebro-spinal centre.

44. It will follow, from a due consideration of the usual procession of morbid action, that the disorder, whether denominated irritation, erythism, morbidly exalted nervous function, &c., commencing originally in either the *fourth* or *fifth seats*—in either the digestive canal or other parts—will frequently, and after various periods, superinduce either the *first*, *second*, or *third* of these pathological conditions, or all of them in succession; and while they, severally or singly, are attended by spasm, more or less persistent or momentary—tetanic or convulsive, continued or paroxysmal—the great difficulty which the physician will have to contend with, is to decide respecting the origin and seat of disorder and the progress it has made, conformably with the procession of morbid actions now demonstrated. To ascertain these points with due precision, also, the remote causes, the more immediate effects of these causes, and the whole history and progress of each case, require accurate examination; and the functions of parts deriving nerves from the several sources already indicated should be duly investigated. The accession, the progress, and termination of each attack—paroxysmal or more or less persistent—ought to be carefully and closely observed, in respect, 1st. Of the functions of ingestion, digestion, and defæcation. 2d. Of respiration, circulation, and vascular action. 3d. Of the functions of sense, and of altered sensibility. 4th. Of cerebral manifestations and consciousness.

45. When there is, in connexion with spasmodic or tetanic action, increased sensibility of the surface of the body, the membranes of the spinal medulla are obviously implicated. If with these symptoms there be also a morbid exaltation of the senses of hearing, seeing, &c., the extension of irritation or of inflammatory action to the basilar parts of the brain may be suspected. If the spasm be accompanied with anæsthesia of the surface, either consecutively upon increased sensibility, or primarily, or with impairment or loss of the functions of sense, the presence or supervention of congestion, or of effusion, or of softening, in those parts of the nervous centres, upon states of irritation, erythism, or inflammatory action, may be inferred; the extent and seat of spasm, and of impaired or lost sensation, indicating the seat and extent of the pathological condition. If in connexion with, or consecutively upon, spasmodic contractions, there be loss of all consciousness—of all the functions of sense, and all the manifestations of mind—as in epilepsy, and in puerperal and some other forms of convulsion, &c., it may be inferred that the irritation, whether cerebral, spinal, or in parts remote from these centres, so affects the medulla oblongata or the central parts of the base of the brain as to occasion spasm of the respiratory muscles, especially of the glottis and diaphragm, or to paralyze or arrest their functions, either for a time or fatally; if for a time only, the cerebral congestion attending the paroxysm and the imperfectly oxydized blood serve to dissolve the spasm by paralyzing for a brief period the previously irritated nerves, a return of the normal state of the functions ultimately resulting; if fatally, the protracted spasm and the consequent congestion and asphyxia terminate existence.

46. The views now stated explain the alliance of tetanus or trismus with the spasms or convulsions of infants and children, as well as of adults; for, as long as the parts of the base of the brain, which are more intimately connected with conscious sensibility, are not implicated in such a manner as to abolish their functions either for a time or forever, the attack is simply spasmodic or convulsive, consciousness and mental manifestation being unimpaired. When, however, the powers of mind and consciousness are affected, the extension of disease to the brain, or the primary affection of some part of this organ, is made manifest, and the attack is either epileptic or apoplectic, according to its mode of accession or to the phenomena attending and following it.

47. *B.* In *Epilepsy* and in the *epileptic convulsions of the puerperal states*, there are present not only the spasms of the muscles of the neck and face, but also most of the other phenomena of tetanus, in either of the forms already defined, often modified, but sometimes almost identical with them, although generally of a short or paroxysmal duration. The chief distinction, however, is in the sudden accession of unconsciousness which is generally contemporaneous with, or somewhat antecedent to, the spasm. In all cases of spasm or convulsion, accompanied with unconsciousness, the muscles of respiration are early affected, and cerebral congestion and imperfect oxygenation of the blood result, these conditions tending to dissolve the spasms, and thereby to admit of the return of a normal state of respi-

ration, if they are not so excessive or persistent as to destroy life.

48. *C.* In *Apoplexy*, and more especially in that form which was first described by me under the name of *convulsive apoplexy*, tetanic rigidity of muscles, more particularly of those of the neck or limbs, with various convulsive movements, is more or less manifest. Although in these cases the vessels of the brain are very frequently diseased, and the substance of the brain consecutively altered, with hæmorrhagic clots, yet the spasms, tetanic contractions, and convulsive movements are not to be imputed so much to these and other allied alterations in the substance of the brain, as to changes in the membranes, especially in those parts which cover the central and basilar parts of the cerebrum.

49. *D.* The tetanic spasms and convulsions observed in the more violent *paroxysms of hysteria* are seldom accompanied with unconsciousness; or, if they be so attended, the loss of sensation is incomplete, and supervenes gradually, whereas it is instantaneous and complete in the fully-developed fit of epilepsy; and it comes on gradually or suddenly, or is incomplete or complete in convulsive apoplexy, the contractions of the muscles being either very extended or limited in either malady. The chief differences in the spasmodic or muscular contractions, characterizing these diseases and the several forms of trismus and tetanus, are that they are either subordinate phenomena, or of comparatively short duration in the former, while they constitute the characteristic feature, the most dangerous symptom, and the cause of death, in the latter.

50. *E.* In the tetanic contractions characterizing the *convulsions of infants and children*, especially the form termed *eclampsia*, there is generally more or less affection, primary or propagated, of the cerebro-spinal centres, or of their membranes. If the brain be unaffected, the functions of sense and consciousness are not materially disturbed during the attack; but if these functions be manifestly impaired or lost, the mischief is in the brain or its membranes, or is propagated thither either along the spinal cord or its membranes, or directly from the seat of irritation, by means of the ganglial or sympathetic nerves. In young children and infants, when the irritation is in the stomach, or in the bowels, or in the gums, it is often difficult to determine whether the muscular contractions are attended by loss of consciousness or insensibility. In many cases they are not thus associated, as evinced by the senses of sight and hearing, by the sensibility of the surface, and by the free and unembarrassed cry; this last more especially indicating that the function of respiration is unaffected. In other cases, even when the irritation is seated in one or other of these parts, the cerebro-spinal centres may not be implicated at first, but they may become affected sooner or later, and be the chief seat of disease, as commonly observed in other convulsive maladies attacking either children or adults. (See *arts.* Convulsions, § 22, *et seq.*, and Spasm.)

51. ii. The Effects of Muscular Contractions on the Circulation have not received sufficient attention from pathologists. It is manifest that the changes produced on the circulation by muscular contraction, inordinate either in degree or in continuance, will vary with these conditions, and with the muscles affected. The provisions so wisely made as to the return of blood from the brain and spinal cord: the sinusus within the cranium, and the venous sinuses of the spinal column are so arranged, as very greatly to diminish or to counteract the ill effects of arrest of the return of blood from these organs; nevertheless more or less obstruction to the return of blood from them is produced by violent or protracted spasm, chiefly by pressing upon venous trunks, or by interrupting the passage of air into the lungs, or by preventing the relaxation, or by continuing the contractions, of those muscles, upon the alternate relaxation and contractions of which respiration depends. In these cases, the right auricle of the heart becomes over-distended, the return of blood from the brain impeded, the liver becomes congested, and the circulation through the lungs insufficient for the oxygenation of the blood; asphyxia and cerebral congestion being the ultimate results.

52. iii. The Influence of the Blood on Muscular Contraction is even greater than that of muscular action on the circulation. According to the states of the blood circulating through muscular parts, the contractions of these structures may be exalted, spasmodically excited, or weakened, or even altogether abolished. Much of these states is doubtless owing to the influence of the blood upon the nervous centres, from which the affected muscles derive their nerves; but it is not unreasonable to infer that a highly oxygenated state of the blood will impart tone directly to the muscular fibre, that an opposite state of the blood will impair the tone of this fibre, and that the accumulation of acid, acrid or irritating elements or materials in the blood, occasioned by interrupted excretion or otherwise, will sometimes cause not only exalted or morbid contractions of muscular parts, but also irritation and vascular excitement of the substance and membranes of the nervous centres. If the vascular excitement go on to the usual condition and consequences of inflammatory action, these changes will rarely be limited, although more manifest in one part than in another, for the exciting pathological cause is general, being present in the blood, and implicates both the nervous structures and their membranes; whereas the more common exciting causes of inflammation chiefly act locally, and affect a portion only of these structures, although often extending more or less to adjoining parts.

53. V. Causes.—*A. Predisposing Causes.*—The several forms of tetanus are more frequent and more fatal in the male, than in the female sex. This is partly owing to greater exposure of the former to the exciting causes, especially to injuries, accidents, and wounds. Of the influence of temperament in favouring the occurrence of the disease, we have no certain knowledge; but probably the nervous and irritable temperaments are most prone to it. There is no doubt of the much greater liability of the negro race to every form of tetanus or trismus, than of the white race. Climate and locality have a marked influence in predisposing the frame to a tetanic seizure. This is evinced by the much greater frequency of the malady in hot, than in temperate climates, and in humid and malarious localities, than in dry situations. Disorders of the digestive organs, especially the retention of morbid secretions and excretions in the digestive canal, the existence of intestinal worms, the failure or arrest of the depurating functions, and the consequent contamination of the circulating fluids, are among the

most frequent causes of predisposition. Bodily fatigue, harassing duties and occupations, excessive muscular exertions, and irregularities of diet or unwholesome food, are also causes of predisposition. The catamenial period, parturition, and abortions also favour the occurrence of the disease in females.

54. *B. The exciting causes*, in temperate climates, are chiefly injuries and surgical operations. Punctures and lacerations of fascia, tendons, and nerves; lacerations and ligatures of nerves; and injuries of the extremities, especially of the hands and feet, are the most frequent causes; but wounds in any situation or part of the body, and of every kind and grade, from the sting of a bee or wasp, or the abrasion of the cuticle, to the amputation of a limb, may produce tetanus. A cleanly incised wound is much less likely to occasion this disease than a puncture or laceration. But although these injuries are chief causes of the attack, the influences of the predisposing causes, and of those which are mainly concerned in producing the idiopathic form of the disease, in concurring to develop the malady, should not be overlooked. The causes which thus give rise to the idiopathic state of the malady, and which so often concur with injuries in developing the symptomatic form, are, vicissitudes of temperature, exposure to the heat of the sun, more particularly to the sun's rays, and soon afterward to the chills, dews, and cold of night; sleeping on the ground, especially when exposed to the night dews or moon's rays; exposure to currents of air, or to cold and wet in any way; drinking cold water, or other cold beverages, when the body is perspiring; imprudent cold bathing; sleeping in confined and ill-ventilated apartments; breathing a contaminated or a miasmatous atmosphere; and such laborious occupations as making trenches, digging clayey soils, &c. While these concur with, or aid injuries or wounds, in giving rise to tenanus, they frequently of themselves occasion the disease, especially in hot climates, and in the dark races, more particularly the negro race, by arresting the eliminating processes, and by favouring the accumulation of morbid materials in the blood, which enter into new combinations, and irritate the nervous centres and membranes, and the muscular structures themselves, both directly and indirectly, by means of the nerves. Owing to a stricter attention in preventing these predisposing and concurring causes, and to the adoption of a more wholesome diet and regimen, the several forms of tetanus are now much less frequent than they were many years ago, more especially the traumatic or symptomatic form. Tetanus may be produced by some poisons, particularly by nux vomica, and its preparations. (See *art.* Poisons § 364–381, *et plurics.*)

[Larrey thinks that tetanus has often been produced by including a nerve in taking up an artery, especially in climates favourable to the production of the disease. He thinks that mischief more certainly arises when the ligature does not compress the nerve very powerfully, and therefore advises, in such cases as do not permit of the omission of the ligature, that it should be drawn very tightly, so as to compress the nerve very strongly.]

55. As I shall have to show hereafter, certain of the exciting causes seem to act more directly on the spinal medulla than others, while many of these causes occasion a state of the most distressing irritation, transmitted through the medium of the ganglial system, or of the sentient nerves, or even through the media of both, to the cerebro-spinal centres, and thence reflected on the muscles of voluntary motion. Thus worms in the digestive canal not only predispose to attacks of traumatic tetanus, but also directly occasion the idiopathic form of the malady. That these parasites are no infrequent cause of tetanus has been insisted upon by Avicenna, Schenck, Hillary, Bisset, Rush, Chalmers, Michaëlis, Rahn, Zulatti, and De Haen; and not by worms only may the disease be thus occasioned, but also by whatever inordinately irritates the intestinal canal, as the retention of the meconium, or the use of drastic purgatives, in infants. I have seen it caused by internal strangulation of the bowels, the primary lesion being accurately ascertained only after death. A temporary state of tetanus has even been produced by the passage of gall-stones, as was shown by a case which lately came under my care, emprosthotonos, of many hours' duration, having been thereby occasioned, with the slowness of the pulse which usually attends this form of biliary obstruction, the attack having been not only severe, but also protracted. Tulpius has recorded an instance of the disease having been occasioned by calculi in the kidneys; and I have observed the sufferings produced by the passage of calculi along the ureters, accompanied by spasms so general, so continued, and so severe, as closely to approach the tetanic state.

[Dr. Eberle has related a case where he supposed tetanus was caused by a dead fœtus *in utero*, but Dr. Dewees regards this and similar cases as instances of *post hoc, ergo propter hoc* reasoning, as it is very common for children to perish *in utero*, whereas this is almost the only instance on record where tetanus has been attributed to this cause. Fournier relates a case somewhat analogous, and thinks that during a violent and inefficacious labour, from extreme irritation of the uterus and neighbouring viscera, tetanus may be produced, which will subside on the delivery of the patient. Spasms undoubtedly not unfrequently occur during labour, in which every muscle of the body may be affected with tetanic contraction, coincident with contraction of the uterus, and rendering the latter wholly inefficient; but these are not cases of genuine tetanus, as the symptoms cease as soon as delivery is accomplished, and may be produced, as Dewees has suggested, by a peculiar distribution of the sacral nerves, on which the head of the child is made to impinge by the contractions of the uterus.]

56. Several of the causes are very rarely productive of the malady, as caries of the vertebræ; while others which had more frequently occasioned it, are fortunately not so often observed now as in former days. Tetanus not seldom followed a recourse to torture, as torture was practised either by civil authorities or by pseudo-religious inquisitions, or by military and naval commanders; but whether the wretched result proceeded from the excessive pain thereby produced, or by the irritation excited in the tissues —the integuments, the nerves, the muscular or the tendinous fibres—of the parts which sustained the injury, cannot be readily determined. Harder says, that he has seen it follow pain only; but it may justly be admitted, that excessive pain may have predisposed the system to be affected by the irritation more permanently devel-

oped in the seat of torture. That the disease may follow either burns or scalds has been admitted by many writers, and has been shown by SMITH, FIZEAU, and others; and that it may be caused by fright or terror has been proved by RIEDLIN, PIDERET, HANSA, BIERLING, and LATOUR. DE HAEN says that he has seen it produced by retrocedent gout; and probably the *materies morbi* of gout in the blood had so excited the spinal medulla and membranes as to develop a state of morbid or continued contraction of the muscles, amounting to idiopathic tetanus.* WRIGHT and other writers have insisted much upon the influence of insolation in warm climates, or in warm seasons in temperate climates, in occasioning tetanus, and with much justice, as intertropical physicians will admit; and no less just and important is the fact shown by AVICENNA, and adverted to by many since the days of the celebrated Arab, that sleeping on the ground, especially after exposure to the sun's rays, or while exposed to the night dews or to the moon's beams, is a most influential cause of idiopathic tetanus, and of the development of the malady after injuries, wounds, &c.

57. *C.* The *Formative period* of tetanus, or the time which elapses from exposure to the causes until the commencement of the attack, is a matter of some importance, as respects the elucidation of the manner in which the causes act, and the employment of measures calculated to prevent the development of their effects. The duration of this interval is most various—from an hour or two to fourteen days—most frequently, in cases of injury, from the fourth to the fourteenth day. In the returns furnished by Sir J. MACGRIGOR, the interval never exceeded three weeks. Sir G. BLANE mentions four weeks as the longest period. Sir B. BRODIE observed the disease to commence generally in the second week. Mr. CURLING refers to an instance recorded by Mr. WARD, of the occurrence of the malady ten weeks after a burn in the axilla. May not some other cause or causes have occurred in this interval?

58. It has been noticed by Mr. CURLING and others, that the longer the interval between the receipt of the injury and the appearance of the symptoms, the less acute and dangerous is the disease. In thirteen cases the symptoms did not commence until three weeks after the wounds, and only four of these were fatal; and of seven cases in which the symptoms did not appear until a later period, or about four weeks, only two terminated fatally. The more rapidly the disease follows its exciting cause, the more acute and fatal does it prove, in both the idiopathic and the symptomatic form.

59. *D. The state of the injury* or wound at the commencement of the disease is a subject of interest. Dr. RUSH remarked, that there is an absence of inflammation or free suppuration from the wounds causing tetanus. This generally appears to be the case. The injury either seems to be healing, or is quite healed, and even forgotten, when the disease commences. In some instances a feeling of irritation is referred to the injury or cicatrix; and in others a cause of irritation, of a material or palpable nature, is detected in one or the other, or is found to affect a branch or filament of nerve. In others no such feeling or cause apparently exists. If a healthy suppuration have existed in the wound, it is usually suspended, and is followed by an ichorous, or scanty sanious discharge, just before the accession of the spasms of the muscles of the jaws and neck and the difficulty of deglutition, or contemporaneously with the accession of the premonitory symptoms mentioned above (§ 4).

60. VI. THE PROGNOSIS.—The *issue* of tetanus varies with the causes, and with the form which the disease assumes. A fatal result is most frequent in the traumatic form. It is less frequent in the idiopathic form, and much less frequent in the sub-acute, whether idiopathic or symptomatic, or when the malady is prolonged beyond the ninth or tenth day. Much, however, depends not only upon the exciting or efficient cause, but also upon the influence of concurring causes, as exposure to cold and wet, to malaria, or to an impure or often respired air, and the presence of intestinal worms, either, or all, of these tending remarkably to increase the mortality of the traumatic form. The concurrence of malaria or other impurities of the air, with exposure to cold, also greatly increases the fatality of the idiopathic states of the malady. Recovery very rarely takes place if the pulse rise above 110, in the intervals between the exacerbations on the third day, especially in the traumatic form; still more rarely, if it reach 120 on that day; and no hopes may be entertained, if the pulse in that form reaches this latter frequency on the second day, or at an earlier period. Dr. PARRY thought that, if the pulse of an adult be under 110 on the fourth day, the prognosis is favourable; and if 120 or upward, unfavourable; but cases frequently terminate fatally on the third, fourth, or fifth day, and yet the pulse, in the intervals between the paroxysms, has not risen above 100 or 110, or even, according to some writers, above 80 or 90, although this latter state of the pulse, in acutely fatal cases, does not quite agree with my observation. Dr. DRUITT has very truly and ably stated that, "as a general rule, the prognosis is *favourable*, if the complaint is partial—if it does not affect the muscles of the glottis—if it has lasted some days, without materially increasing in severity—if it is sensibly mitigated by the remedies employed—if the pulse is not much accelerated—if the patient sleeps—and if he has been subject to it before, in an intermittent form. On the other hand, the prospect will be *unfavourable*, if the spasms continue to increase in severity, and especially if they affect the

* [Dr. TODD ("*Phys. of the Nervous System*," 1847) maintains the humoral origin of tetanus—producing a peculiar excitability or "exalted polarity" of the spinal cord: originating, in traumatic tetanus, at the distal extremity of the nerve, while its extension and implication of the spinal cord are due to the existence of some special poison in the blood, the introduction of which is dependent either upon some general depravation of the nutritive processes, or possibly, in traumatic cases, on some morbid action taking place in the wound. What lend support to this view, he thinks, are the absence of pathological changes in the cord, in death by strychnine, the occasional endemic prevalence of tetanus, the known dependence of trismus nascentium and of laryngismus stridulus on a disordered state of the nutrition, imperfect ventilation, and other influences tending to deprave the blood, &c. "The much greater facility," he remarks, "of inducing this polar state of the spinal cord by the introduction of certain substances into the blood, even in almost infinitesimal quantity, than by mere mechanical irritation of the nerves, strongly points to and favours the conclusion, that a change in the natural condition of the blood may greatly promote, if not wholly cause, the development of the tetanic state; and this change in the blood may be caused either by the introduction into it of some new material from without, or by the generation within it of some new matter possessing highly poisonous qualities."]

muscles of the glottis;" and I would add, or if they extend to the diaphragm and other muscles of respiration; and if the disease be very acute and the pulse very frequent on the second day.

61. VII. Pathological Inferences and Remarks.—*a.* That a predisposition, original or acquired, exists in some constitutions to be affected by tetanus, when the exciting causes, by their nature or their concurrence, are brought into operation; that this predisposition is most evident in its original state, in the negro race, and in the darker races; and that males appear to be more susceptible of this malady than females.

62. *b.* That depressed states of organic nervous power, connected with nervous susceptibility and with increased irritability, seem to favour the occurrence of an attack of tetanus; and that, still more especially, the presence of worms in the digestive canal, disorders of the digestive and intestinal functions, intertropical or warm and miasmatous localities, or otherwise contaminated states of air, and the arrest of the excreting processes, farther tend to favour the appearance of the malady, by accumulating excrementitious materials in the blood, and aid the operation of the exciting causes enumerated above (§ 54, *et seq.*).

63. *c.* That the lesions of the nervous centres of animal life, on which tetanus has generally been supposed to depend, may be, 1st. That of erythism, or of irritation, in which vascular injection and organic lesion are either not seen, or not manifested to any considerable amount, or so as to be admitted as inflammatory; 2dly. Or that of increased vascularity and the changes generally viewed as constituting inflammation, or consequent upon it; 3dly. Or, any change intermediate between the extremes of these states—the minima of the former, and the maxima of the latter—may be inferred to exist in cases of the several forms of this disease.

64. *d.* That similar lesions, in their nature and amount, to those just stated may exist in the sentient or centripetal nerves, or in the ganglial nerves, which are the media by which the irritation is transmitted from its primary seat to the spinal medulla and central parts of the base of the brain, although lesions in these communicating nerves are not easily ascertained, traced or rendered apparent after death; or they may be such as are compatible only with the living state, and disappear soon after dissolution.

65. *e.* That any irritation at the periphery of the nervous sphere may be propagated by sentient nerves to that part of the nervous centres with which the part irritated is most intimately connected or related, and be reflected thence upon muscular parts, through the motor nerves which are most intimately connected with those portions of the nervous centres to which the irritation is transmitted.*

66. *f.* That the irritation of the muscular structures themselves, directly produced by the accumulation of morbid and irritating materials—acid or saline—in the blood, may induce a more or less continued state of spasm of the muscles, and the existence of these materials in the blood, may perpetuate this state and superinduce farther changes in the nervous centres and in their membranes, this state of the blood being produced as above noticed (§ 52).

67. *g.* That the irritation thus excited may be perpetuated or continued to the extinction of life by asphyxia or by vital exhaustion, without the changes actually constituting inflammation having been developed—at least to an amount admitting of their permanent manifestation or undoubted existence after death.

68. *h.* That, although this (§ 67) may be the case, especially in the traumatic form of tetanus, and more especially when the ganglial system, which is so intimately connected with the existence of irritability in all animals, is brought within the sphere of morbid action, yet inflammation and its usual consequences actually does sometimes take place, but not so frequently and evidently in the traumatic as in the idiopathic malady.

69. *i.* That the inflammatory changes observed particularly in the idiopathic form, as when occasioned by insolation and by subsequent exposure to cold or the night dews, or by sleeping on the ground, &c., may be early produced, the tetanic phenomena being merely the manifestation of the early inflammatory state and changes in the membranes or substance, or in both, of the spinal medulla, extending often to, if not originating in, the medulla oblongata and the central parts of the base of the brain; and that the changes, whether inflammatory or merely irritative and incapable of demonstration, which first take place in the nervous centres of animal life, should be looked for in the parts most intimately connected with the origins of the nerves supplying the muscles of the pharynx, lower jaw, throat, and neck; these changes, as they extend along the membranes of the medulla oblongata and cord, extending the sphere and the severity of the malady.

70. *k.* That in these cases (§ 69), according to my observation, the pain which is commonly felt in the occiput, and in the cervical and dorsal regions of the spine, with the throwing backward of the head, &c., in addition to the symptoms pathognomonic of tetanus, early declare the seat and nature of the disease—irritation or inflammation of the parts now mentioned (§ 69).

71. *l.* That in cases which arise from irritation in some distant part, transmitted to nervous centres and reflected thence upon contractile structures, and in which inflammatory action is either absent, or its existence is problematical at an early period of the malady at least, we can now infer, agreeably with what we know to take place in the animal economy, that inordinate or continued contraction of muscles can exist, without an increased demand being made upon the circulation supplying the nervous centres which actuate these muscles; and hence we may conclude that increased vascularity, or even the earlier states of inflammation, of these centres and of these membranes may be the necessary consequences of the continued and inordinate muscular action constituting the disease; the augmented determination of blood thus directed to these nervous centres tending to the perpetuation and the extension of the muscular contractions, and thereby to the more or less rapid extinction of life.

72. *m.* That, notwithstanding this condition of the nervous centres of animal life, whether primary or superinduced, it is most probable that the contractions would not become so persistent, or the spasms so severe and frequent, if the gan-

* This view is identical with that stated with reference to the pathology of Cholera, Chorea, and Convulsions, articles which were written more than three years, and published in 1832, or about two years before Dr. M. Hall's earliest writings on the reflex *function*.

glial system preserved a normal state of function, or was free from irritation or vascular excitement.

73. *n*. Inferring, as stated above (§ 63, *et seq.*), that tetanus may depend upon, or be connected with, one or other of three pathological states of the nervous centres of animal life, namely, 1st. Upon inflammatory action of these centres or of their membranes, especially in the idiopathic form of tetanus; 2d. Upon inflammatory action superinduced upon irritation transmitted from the periphery of the sentient nerves to these centres, or from ganglial nerves to these centres, and thence reflected on contractile structures; and, 3d. Upon irritation thus transmitted and thus reflected, without sufficient proof of inflammation. It should become an object to ascertain with all possible accuracy to which of these pathological states the case belongs to which we are called to administer relief; for, upon the inferred pathological condition, the indications and the plans of cure should be based.

74. *o*. Many of the changes which are presented by the lungs, the heart, the blood, and even by the liver and digestive mucous surface, are manifestly results of the mode of death. Those seen in the pharynx and glottis are evidently caused by spasms of those parts, consequent on the irritation or inflammation, or both, existing in the medulla oblongata and its vicinity, and upper portions of the spinal medulla, or their membranes. Yet other morbid appearances may exist in different portions of the digestive canal, or in one or other of the urinary or genital organs, which cannot be viewed as the results either of the malady or of the mode of death; but which may be considered as being either sources of irritation, or as concurring aids to irritation, or merely as accidental and unimportant changes: if they be viewed in the former light, it becomes important to ascertain how far they can be connected with the early or premonitory symptoms, and to determine the manner in which the functions of the organs in which they were seated had been discharged.

75. *p*. That, when tetanus follows irritation or injury in some peripheral part of the nervous system, the division of nerves or parts between the seat or cause of irritation and the nervous centres most frequently fails of arresting the disease; such failures evincing the superinduction and extension of the irritation, or other morbid condition constituting the malady, to the nervous centres of animal life, and probably also to the organic or ganglial system, to which I imputed irritability in its normal manifestations very many years ago, and more recently in this work. (See *arts.* IRRITABILITY and IRRITATION.)

76. VIII. TREATMENT.—A slight experience of the different modifications of tetanus, more especially of the idiopathic, symptomatic, and infantile forms, is sufficient to show the justice of the distinctions which I have endeavoured to establish, between what may be considered as the inflammatory and the irritative states of the malady. But as either state does not exist simply or unassociated—as one condition is accompanied with more or less of the other—as the irritative often sooner or later becomes inflammatory, or the former state frequently induces the latter, the difficulty of determining in practice how far the one state may exist independently of the other is remarkably great. Unfortunately, a simply inflammatory state either of the membranes, or the substance of the central parts of the base of the brain and medulla, or of both the membranes and substance of these parts, is seldom so manifested as to admit of a distinct recognition, the very phenomena which it sympathetically produces either masking its presence, or throwing doubts on its existence. Besides, irritation is so nearly allied to inflammation, even when it exists simply, and so often excites the inflammatory state, by eliciting vascular determination and injection—"ubi irritatio, ibi fluxus"—that we can hope only to reach an amount of accuracy which may not altogether be deserving of being considered erroneous. If the difficulty of ascertaining pathological conditions, upon which all rational indications of cure should be based, be so great in this malady as not to have hitherto been overcome, can it be a matter of surprise that the means which have been resorted to, both by physicians and by surgeons, in its treatment, have been most opposite in their effects, the most different in their natures, and in every respect most empirical and uncertain? In this state of our knowledge it would be better to leave Nature to her unaided efforts, to observe closely and accurately what is the true procession of changes and of their manifestations, and to ascertain the seats and the extent of lesion as soon after death as may be attempted with propriety.

77. I have contended above, more strenuously perhaps than any previous writer, for the inflammatory character of this malady, especially in the idiopathic form. But admitting the existence of this character, as manifested by the changes observed after death, the following questions remain to be determined, namely, Is the inflammatory state necessarily or always evident to the close observer during the life of the patient when it actually exists? and, if it be evident, Is it most successfully treated by the usual means resorted to, when combating the sthenic form of inflammatory action? 1st. As respects the former question, it may be said that inflammation of either the substance or the membranes of the spinal medulla, or of the medulla oblongata, or parts in the vicinity, is often ascertained with great difficulty. This is apparent from what I have said when treating of spinal inflammations (see *art.* SPINAL CORD, &c., § 137, *et pluries*); and there I have viewed them as they are usually presented to both physicians and surgeons in the course of practice—as commonly limited to a portion only of either the membranes or substance of the cord, or as advancing along them gradually, and attacking successively adjoining portions. But, when the inflammatory action of these parts extends rapidly, or takes place almost coetaneously, the effects upon contractile structures are quickly and extensively manifested. Whether, therefore, it be irritation or inflammation which is produced in the spinal medulla and its membranes, or irritation quickly inducing a certain amount of vascular injection or inflammation, or merely an exalted polarity of the spinal cord, as contended for by K. SPRENGEL, there is reason to infer that the morbid condition is at first limited in extent, although advancing rapidly, and that it commences in the more immediate vicinity of the origins of the nerves supplying the muscles of the pharynx, lower jaw, and neck. When pain is felt in the cervical region of the cord, extending either upward to the occiput or downward to the dorsal and lumbar regions, when the sensibility of the

surfaces, whose nerves are connected with those parts of the nervous centres, is unusually increased, or when any stimulus acts upon the muscles connected with these parts, so as to occasion spasm or distress, as when attempting to swallow, it may then be inferred that a morbid action, usually termed inflammatory, is really present in the membranes or structures of these parts, although pain and other symptoms may not be exasperated by pressure on that portion of the spine where inflammation of the cord or its membranes is indicated; pressure no farther influencing the pain than it would if it were made upon some part of the cranium when the brain is similarly affected.

78. 2d. Admitting the presence of inflammation in the spinal medulla, or central parts of the base of the brain, or their membranes, in many, if not in the great majority of cases of tetanus, either at an early or in an advanced stage, or consecutively upon transmitted irritation, the success of such means as are usually employed against inflammation still remains questionable. We know that the term inflammation has been applied to very different states of vascular injection, as I have shown when treating of inflammation, and that these states differ as to the current through the capillaries, as to the power or tone which these vessels manifest, as to the products or fluids which are exuded from them during these states, and as to the extension of the morbid action or condition to continuous or contiguous tissues. Hence, even when the first question is admitted in the affirmative, we must have recourse to the results of an enlightened experience for our answers to the second; and these answers only can be given, so as to be satisfactory, by referring to the effects of such means as are most successful in removing changes commonly considered as, and denominated inflammatory. But it should not be overlooked, that it has been most satisfactorily shown that these changes are so different in their local characters, in their constitutional relations, and in their tendencies and results, as to require for their successful issues very different and often opposite means of cure; the differences being occasioned chiefly by the varying grades of organic nervous power, and by the presence of irritating or injurious excrementitious materials in the blood (§ 52). These facts have been fully illustrated when treating of the several forms, varieties, and modifications of *Inflammation* in the different organs and tissues; and what has been proved and admitted of inflammation generically, and of the special manifestations of it in these organs and tissues, may be extended to inflammation in those parts of the substance and membranes of the nervous centres to which the disease has been now chiefly referred.

79. But it should not be overlooked that while the fully-developed malady may be attributed to an inflammatory state of these parts, induced by transmitted irritation, the primary morbid condition, especially in the traumatic or symptomatic form of the malady—the irritation existing, whether manifested or not, in the seat of injury, propagating itself to the nervous centres, there developing morbid action, and perpetuating reflex muscular contraction—should be attempted to be removed or counteracted by the most efficient and appropriate means. While the local or primary irritation exists, or its transmission along centripetal nerves is not interrupted or prevented, the procession of irritation to inflammatory action, and the extension of this action along the membranes, with the reflected muscular contractions, are thereby promoted, and the morbid consequences—the tetanic contractions and spasms—necessarily aggravated. Therefore, at all periods of the malady, but as early in the treatment as possible, means should be employed, in *the traumatic form* of the malady, *to arrest the transmission of irritation from the seat of injury to the nervous centres, or to allay irritation in this seat.*

80. *A.* THE LOCAL TREATMENT of traumatic tetanus should therefore be as early as possible determined upon; the means being such as are most suitable to the nature of the injury. To obtain the end now stated, 1st. Amputation or excision of the wounded part; 2d. Division of the nerves proceeding from the seat of injury; 3d. The application of agents calculated to procure a healthy action or a free suppuration in the injured parts; and, 4th. A recourse to soothing or anodyne applications to these parts, and in the course of the nerves proceeding from them, have been severally recommended, and have been found of service in some cases, and inefficacious in others. It is obvious that, when the symptoms of tetanus, and even when those of its first stage, trismus, have appeared, the pathological changes in the nervous centres and their membranes have already commenced, although they may not be fully developed; and that the removal of the remote irritation which produced these changes may not then be influential in subduing them. Nevertheless, the removal of the cause may render the effects either more mild or more controllable by treatment—may prevent the effects from reaching that amount which the continuance of the cause might develop.

81. *a.* Instances of recovery from acute traumatic tetanus, after *amputation* had been employed in order to arrest the attack, have been recorded by LARREY, VALENTIN, WHITE, HOWSHIP, and others; but recourse to it has also failed with many. Mr. CURLING states that it was performed in eleven of the cases in the table which he has given, and of these seven were cured. In most of these, however, the operation was resorted to before the symptoms were fully developed, at which time only should hopes of success from it be entertained.* It is inadmissible in sub-acute tetanus, unless the condition of the injury be such as demands the operation independently of the spasms; for most of the cases of this form recover, often notwithstanding the treatment which has been adopted. Mr. CURLING very justly remarks that amputation is justifiable only after a severe injury of the extremities, immediately that there is the slightest indication of spasm; for, if delayed until the disease is more advanced, instead of proving beneficial, it will rather aggravate the symptoms and render the constitution less able to sustain the exhausting effects of the spasms.

82. *b. Division of the nerves*, in order to arrest the transmission of the irritation from the injured part, and even of the *tendons* and *aponeuroses*, when these are lacerated or injured, has been ad-

* [We apprehend that no physician would be justified in resorting to amputation "before the symptoms of the disease were fully developed," as tetanus is a rare affection, and there is no certainty of its occurrence, even after spasmodic symptoms have appeared.]

vised and practised in some cases with marked success by SCHMUCKER, HICKS, DELAROCHE, MURRAY, FOURNIER, STÜTZ, LARREY, [HALL,] and some others. When this operation can be performed so completely as to comprise all or the chief nerves proceeding from an injured part, it should not be neglected, nor delayed until the disease is fully evolved. It is in every respect to be preferred to amputation. Dr. PENNOCK has advised the application of ligatures or cupping-glasses, in order to paralyze the nerves, when a complete division of them cannot be effected, as previously recommended for poisoned wounds. In cases of cutaneous or superficial injuries, &c., these means may be resorted to.

[Dr. MARSHALL HALL states that "the first indication of treatment in traumatic tetanus is to divide the injured nerves;" and the second, "to subdue the spasmodic affection by such remedies as the hydrocyanic acid." We have never known division of the nerves produce more than temporary benefit in this disease. Perhaps, had it been resorted to at an earlier period, the effects would have been more salutary. Though local in its origin, tetanus soon becomes a profound constitutional affection.]

83. *c. Incisions* made into the seat of injury, and *applications* which may excite a free suppuration in it, have been recommended by RUSH, VALENTIN, MERCIER, CAMPET, LARREY, PARANT, and many others. The actual or the potential *cautery* has been advised by some with this intention; and a free opening into the seat of injury, or reopening of the cicatrix, or incisions into it, and the application of various substances, with the view of exciting healthy action, have been recommended by others. In one case, I directed the injured part to be freely incised, soon after the occurrence of spasms of the muscles of the wounded limb, and the incision to be filled with lint soaked in equal parts of tincture of opium and spirits of turpentine, the same substances being also applied as an embrocation, on flannel, in the course of the nerves proceeding from the part; but, as the treatment about to be noticed was employed at the same time, the share which these means had in the recovery of the patient is not very manifest; the local symptoms, however, appeared to be much alleviated by them.*

84. *d. Soothing, emollient,* and *anodyne* applications were advised by HIPPOCRATES, CELSUS, CÆLIUS AURELIANUS, and by many of the moderns, to the injured part; they may be employed either immediately or after the division of nerves or the incisions already noticed. These means have not been restricted to the part, but have likewise been applied in the course of the nerves proceeding from it. The agents which have been thus employed by the more recent writers consist chiefly of moist heat, anodyne poultices, fomentations, or embrocations; applications containing either opiates, or conium, or belladonna, &c. It has also been recommended by CERIOLI, LEMBERT, and others, to remove the cuticle from the parts in the vicinity of, or above the seat of injury, and to apply either of the preparations of *morphia* to the denuded surface. It is obvious that these or similar means can be of use only early in the disease, and as aids to other rational measures.

* [Dr DEWEES states that this practice of stimulating the wound was resorted to by himself and Dr. PHYSICK, but without the slightest use.—*Pract. of Med.*]

85. *e.* While *these local means* are more or less appropriate to traumatic or symptomatic tetanus, and chiefly to the acute form at a very early stage of the attack, and are useful aids to the treatment which the pathology of the disease will suggest, the measures about to be passed under review *are equally suitable to all the forms of the malady,* duly adapting them, however, in respect of amount, combination, and succession to the severity and peculiar features of individual cases. It should not be supposed that all cases which recover, especially those which I have denominated as subacute, and more particularly such as are symptomatic of, or associated with, other diseases, as with hysteria, or with epilepsy, or even with the effects of malaria, as insisted upon above (§ 22), are really cured by the means which have been employed. Nature in many of these cases asserts her own prerogative, and carries it above the many and incongruous agents too often irrationally, empirically, and injuriously resorted to. If we consider the diverse and even opposite nature of the measures which have been prescribed for this malady, their apparent success in some instances and their failure in others, and their employment in different states of the disease, with little regard to the modes of their operation in relation to pathological conditions, we necessarily must infer that recovery has sometimes taken place, notwithstanding their use, and not by their aid.

86. *B.* THE EXTERNAL MEANS recommended by writers are almost as numerous as those prescribed internally, and while they have been used as adjuvants by some, they have been more entirely confided in by others.—*a.* Not the least important of these are the *affusion of cold water* and the *cold bath.* The former was prescribed by HIPPOCRATES, but he directed the patient to be afterward wrapped in warm coverings. The cold affusion was also adopted by AVICENNA, SCHENCK, KITE, RUSH, WRIGHT, TALLMANN, and CURRIE, for this disease; and the cold bath by COCHRANE, HARRIS, MOSELY, and the writers now mentioned. CELSUS considered the cold bath to be injurious. FISCHER advised it, opium having been given internally. In the cases in which opium has been taken in large or frequent doses, the cold bath, and more especially the cold affusion on the head and cervical spine, are much less hazardous, if not beneficial, in this disease than when they are resorted to under other circumstances. Both the cold affusion and the cold bath are not without some degree of risk, if the shock produced by either be too sudden or too severe for the amount of vital power. But when judiciously employed, and the effects carefully watched, and aided by appropriate internal remedies, they may, especially the cold affusions, prove most influential means of cure, more particularly in the idiopathic form of the malady. Many instances have been recorded of recovery from acute tetanus, by means of cold applied in either of these modes, or in some other way. The changes found on dissection after fatal poisoning by *nux vomica* and *strychnine* are the same, as respects the spinal medulla, the central parts of the base of the brain, the cerebellum, and their membranes, as those observed in fatal cases of tetanus; and the treatment found most successful in poisoning by these substances is generally appropriate in acute tetanus. (See *art.* POISONS, § 364–381.) M. GUÉRIN DE MAMERS states that the cold affusion arrests the tetanic

paroxysms produced in animals by nux vomica. The application of cold lotions, or of pounded ice, to the occiput and nape of the neck, whenever or as long as the temperature of these parts is above the natural standard, has not hitherto received the attention it deserves as appropriate means in this disease.

87. *b. Warm Baths* and *Vapour Baths.*—The former were recommended by MARCARD and BEHN. Sir J. MACGRIGOR found them to produce momentary relief only. HILLARY and DE HAEN have stated that instantaneous death has sometimes followed their use. This result may have arisen from their temperature having been too high, especially when the patient was first immersed. Warm baths are the safest, if not the most beneficial, when their temperature is at first from 85° to 90°, and gradually raised to 96° or 98°. They have little influence on the acute form of the malady, but they are often of service in the sub-acute and during convalescence. BEHRENDS, MURSINNA, STÜTZ, and MARCUS prescribed warm baths, containing alkalies and aromatics; and ANDERSON recommended tobacco to be infused in the bath, and after the operation of purgatives, wine to be freely exhibited. Warm baths have been employed chiefly in connexion with the internal use of stimulants, tonics, and anti-spasmodics. Dr. MARSH has recorded three cases in which *vapour baths*, at a low temperature, were employed for many hours in succession. Two of the three cases recovered; but they were of the sub-acute form. These baths have been also prescribed by several Continental physicians, but with no advantage in the acute form of tetanus.

88. *c. Emollient applications* over the spine in this disease were noticed by HIPPOCRATES, CELSUS, CÆLIUS AURELIANUS, and others; and these applications either consisted of vegetable oils, or were aided by *oleaginous frictions* over the general surface of the body. That they may have appeared of some service in sub-acute cases may be admitted; but that they were in any way of service in the acute admits of doubt. *Frictions* along the spine were advised by CELSUS and many others.

89. *d. Rubefacient and oleaginous Liniments and Embrocations*, applied over the spine, were employed in tetanus by ARETÆUS, AVICENNA, RULAND, DE HAEN, and STÜTZ; but the benefit to be derived from them in the acute form was doubtful, although they may have proved of service in the sub-acute. I have prescribed certain of the *Liniments* contained in the Appendix (*see Form.* 295–297, 307, 311) with apparent advantage, or equal parts of the turpentine and of the compound camphor liniments of the London Pharmacopœia, with a little Cajuput oil, when applied constantly along the spine in the form of an embrocation, by means of flannel or spongio-piline. *Sinapisms* and *blisters* over the spine were recommended by RUSH, HUNTER, and LATOUR; but CHALMERS contends that they produce an injurious effect. The application of the *actual cautery* to the neck is mentioned by CELSUS, but it has not received the sanction of modern writers.

[Dr. JOSEPH HARTSHORNE, of Philadelphia, recommends applying over the spine, from the occiput to the sacrum, a solution of caustic potassa (ʒij. to ʒiv. of water), by means of a sponge, till the skin is much reddened, and signs of caustic action are displayed. Dr. WOOD states that this treatment has been employed with much success in a number of cases, in connexion with moderate doses of opium and purging.

Prof. WOOD recommends the removal or correction of obvious sources of irritation; active purgation, bleeding when the pulse is strong and symptoms of inflammation exist; opiates, hemp, tobacco, or aconite, the cautious use of the cold bath, caustic potassa along the spine; the free use of alcoholic stimulants, and nutritious food when symptoms of debility appear. (*See "A Treatise on the Pract. of Med.,"* vol. ii., p. 783.)]

90. *C.* CONSTITUTIONAL AND INTERNAL MEANS. —*a. Antiphlogistic measures* have been advised by many writers, and more or less censured by others, in this disease. But the selection of these measures, the extent to which they may be carried, and their adaptation to the peculiarities of individual cases, are of the utmost importance, rendering them either beneficial or the reverse.—(*a*) Of these means the most dangerous, and yet often the most beneficial, is *blood-letting*. For, if prescribed in cases where debility and irritability are very manifest, where the disease is far advanced, where the pulse is very rapid between the paroxysms, and where the disease follows an injury, bleeding, especially from a vein or to any considerable amount, is more frequently injurious than beneficial. The evidence in its favour is extremely contradictory. It has been recommended by ARETÆUS, CELSUS, PAULUS ÆGINETA, FORESTUS, HILLARY, PUJOL, BISSET, and many others; and its repetition, even oftener than once, has been resorted to by COXE, GARDANE, GUTHRIE, EARLE, &c.; but the results have not always been satisfactory. FLAJANINI states that he has seen death immediately follow blood-letting; while LISFRANC says that it has been carried to an enormous extent and been followed by recovery. Mr. CURLING is not in favour of its adoption, unless early in the disease, and when the attack is decidedly inflammatory. In this, as well as in other maladies, the physician will be guided by a variety of circumstances. The appearances on dissection seem to favour the adoption of blood-letting, yet these appearances, if not produced, may be heightened by the disease; and, even admitting them to have existed from the commencement, experience has shown that inflammations of the spinal medulla, or of its membranes, are not so successfully attacked by blood-letting as many other inflammations. When the disease is idiopathic; the patient young, robust, and plethoric; the pulse full, strong, and not very frequent or much above 100 between the paroxysms; and the disease is not far advanced, and especially if pain is complained of in the occiput and cervical region; then bleeding by a number of *leeches* applied in these situations, or *cupping* as advised by CELSUS and PAULUS ÆGINETA, appears to be indicated. In the circumstances, also, just mentioned, not only leeches or cupping along the spine, but also venesection, may be practised, and even repeated, according to the effects produced. In more doubtful states, *dry cupping* along the spine may be tried. *Arteriotomy* has been recommended by VOGEL; and several writers have considered, with much justice, that, when blood-letting is indicated, it should be carried to a full extent at once, and not repeated to a small amount at intervals. There can be no doubt that, in all spasmodic and con-

vulsive maladies, however inflammatory the appearances may appear after death, or however accelerated or excited the circulation may seem during life, blood-letting, especially venesection, is a hazardous remedy; and, although sometimes required in a decided manner, particularly in the circumstances and in the way just stated, it requires the utmost caution and discrimination. When it is clearly indicated, the action of other suitable remedies is promoted by it.

91. (*b*) *Purgatives* are essentially requisite in tetanus and trismus; but, in order to obtain satisfactory results from them, they should be given early and decidedly, and selected judiciously. Calomel with the compound extract of colocynth, or with jalap, or scammony, or gamboge, may be prescribed in such doses as will produce, as advised by FORESTUS and HAMILTON, copious evacuations. MOSELEY directed the cathartics to be conjoined with cinchona or other tonics. These, especially the more bitter tonics, generally render the operation of purgatives more certain. In the few cases I have seen, I have prescribed, at first, full doses of calomel with camphor; and, some hours afterward, the spirits of turpentine with castor oil, the action of these having been promoted by enemata containing these oils and some common salt. The frequency of worms in the digestive canal of patients attacked with either idiopathic or traumatic tetanus, has induced me to prefer these means, and to give them in large or repeated doses early and according to the circumstances of the case. The oil of turpentine, when judiciously prescribed in this disease, is not only an energetic anthelmintic and purgative, but also the most certain antiphlogistic and antispasmodic remedy we possess. After the bowels have been freely evacuated by its aid, or by a combination of it with other cathartics, it may be given internally at various intervals, either on the surface of an aromatic water, or in the form of an electuary made with honey and powdered liquorice-root, and may be administered in enemata, or applied along the spine in the form of embrocation (§ 89).

92. Where there is reason to infer that the disease is favoured, or in any degree occasioned by the presence of uneliminated acid, acrid, or excrementitious materials in the blood, the action of the excreting viscera should be excited by means of these and other purgatives, by diuretics conjoined with or alternated with these, or by combining cathartics and diuretics with large doses of the alkaline carbonates, or of the chlorate of potash, or with magnesia and sulphur in full and repeated doses, so as not only to excite the several emunctories, but to change the state of the blood, and to counteract the injurious action of the morbid materials by combining with them and neutralizing their influence and effects.

93. (*c*) *Mercurials*, internally and externally, have been very frequently prescribed in all the forms of tetanus, as purgatives, as alteratives, and as antiphlogistics, and have received the sanction of MANGET, DONALD MONRO, MEASE, KITE, CLARK, ECKER, and others; and calomel, the bichloride of mercury, and the oxides, have been severally employed in order to produce these effects. Calomel, given in full doses, alone or with other medicines, early in the disease, and as a cologogue purgative, is generally of use. But no confidence can be placed in it, or in any other mercurial, as a remedy for tetanus, especially the traumatic form. Mercurials were formerly much employed in the West Indies as purgatives and alteratives for the cure of idiopathic tetanus, but even when ptyalism has been produced by them, no alleviation of the disease has resulted, as shown by MACGREGOR, WELLS, THOMSON, CARLISLE, and CURLING, tetanus even having occurred in persons during mercurial salivation, and the malady appearing to have been aggravated in other cases by the production of this effect. Of twelve cases related by Mr. HOWSHIP, of tetanus consequent upon injuries, in which mercury was freely exhibited, two only recovered, and in both it was conjoined with opium.*

94. (*d*) *Antimonials* are uncertain in their operation in trismus and tetanus, and are liable to the same objections as have been urged against blood-letting, but they also possess the advantages sometimes to be procured from the latter. The preparations which are most deserving a trial in this disease are tartar emetic and James's powder. In a case of sub-acute tetanus treated by Mr. LISTON, the former was given in doses of one grain every hour, and the patient was put into a warm bath thrice in the day, the bath containing in solution half an ounce of tartarized antimony (*Lancet*, 1834 and 1835, p. 581). The pulse after the baths was generally accelerated, but became much softer as soon as the copious sweating by which it was followed appeared. Mr. WOODWARD (*Dublin Journal of Med. Science*, July, 1835) exhibited tartarized antimony in a case of idiopathic tetanus, with the effect of depressing the pulse and diminishing the muscular rigidity. The patient was soon able to swallow, and, by persisting in this remedy, gradually recovered. Dr. ELLIS administered this substance in enemata; but no sufficient experience of the results of this practice has hitherto been furnished.

95. *b. Sedatives* of various kinds have been often prescribed for all the forms of tetanus. Certain of the means already mentioned are more strictly sedative than antiphlogistic, although generally prescribed with the latter intention, especially the cold affusion and antimonials.—(*a*) *Colchicum* has been recommended for tetanus by M. DUFRESNOY. Dr. W. G. SMITH has employed it largely in the West Indies, and, in his opinion, with great benefit. But as he employed several other means at the same time, the amount of benefit which was really due to this powerful medicine remains doubtful (*see* § 114).

96. (*b*) *Tobacco* has been much employed in cases of tetanus. Mr. CURLING remarks that "the earlier writers applied the *oleum tabacci* externally to the back and neck." In a work by Dr. GARDNER, at the beginning of the 16th century, entitled the *Triall of Tobacco*, it is stated that "the suffumigation of tobacco, being taken, is a good remedy for the starkeness or stiffness of the neck called tetanus." CAMPET, who practiced in the French West India Islands in the last century, prescribed tobacco injections and wine by the mouth, and detailed several cases proving the success of the practice. The use of tobacco injections in this disease has subsequently been recommended by O'BEIRNE, ANDERSON, EARLE, TRAVERS, and CURLING. In most of the cases the infusion, or decoction, or smoke of tobacco was administered as enemata, twice or thrice dai-

* [Dr. RUSH records a case of tetanus cured by mercury, aided by bark and wine.]

ly; and wine or other stimuli were given by the mouth, to counteract the distressing poisonous action of the tobacco (see *art.* POISONS, § 523, *et seq.*). This substance is one of the most powerful agents which can be employed against tetanus. It effects are, however, seldom lasting, and it tends very remarkably, when given late in the disease, or when the dose is strong, to depress the powers of life beyond the powers of reaction. I have perused most of what has been written in its praise, and I can truly state that it has often proved injurious, owing to its having been resorted to at a too advanced period of the malady, and in a too powerful form or dose; and, even in the cases where it has appeared to have been of service, its effects appeared very equivocal. In two acute cases which I attended many years ago, the infusion of tobacco was administered as an enema, contrary to my advice, by the other medical men who were also in attendance, and both cases terminated fatally, with all the symptoms of poisoning by tobacco, a few minutes after the administration of the second injection. The bodies were examined after death, and displayed the appearances described above (§ 27, *et seq.*). The decoction or infusion has been also employed in impregnating a warm bath, into which the patients have been immersed twice or thrice in the day.

97. The use of *tobacco* in tetanus requires the utmost caution. The sensations produced by it, when the dose is too powerful, are most distressing, and, when prescribed late in the disease, are such as often fatally prostrate the powers of life. Even when less injurious, patients have expressed the sensations occasioned by it to have been so distressing, that they would rather have endured the convulsions, painful as they were; and that they would hardly be induced to submit to a repetition of the medicine. Mr. CURLING, who is much more in favour of its use than I am, states that, of nineteen cases in the table, in which tobacco was employed, nine recovered. There can be no doubt that this medicine was injudiciously prescribed as to form, dose, and period of the disease, and as to other means resorted to, in some of the fatal cases; but there is as little doubt that, in some of the cases which recovered, the result was not due to this substance. When the use of it is determined upon, in an acute or traumatic case, a scruple of the leaf should be the largest quantity for an adult, infused in twelve ounces or a pint of water, and administered as an injection. The dose ought not to be larger at first, although it may afterward be increased according to its effects. If employed at all, it should be early in the disease; and it may then be so conjoined with other agents as to promote the operation of purgatives given by the mouth. During a recourse to it, the powers of life should be supported by tonics, stimulants, and nutrients, especially by wine, ammonia, and other means about to be noticed.

[*Tobacco* has generally been considered the most certain relaxer of muscular fibre, but the extreme and alarming depression produced by it, together with its distressing effects, are great objections to its use. These objections do not apply to *chloroform*. It not only wholly annihilates pain, but also causes complete muscular relaxation; and it is now sufficiently established that patients may be kept under its influence continuously for many hours, and, with due care, without danger or subsequent ill effects. Several cases of tetanus and trismus have been recorded within the last few years, where it has proved effectual in controlling the disease. It is well known, however, that, though the tetanic spasms will be very certainly overcome by it, yet they will often return, unless the system be kept, to some extent at least, under its influence. At the same time, it is very important that the strength be supported by concentrated nourishment, as essence of beef, &c. Many patients, labouring under this disease, have been relieved by chloroform, but allowed to die from subsequent exhaustion. Where chloroform does not save life, it affords great relief, by subduing the pain, or rendering the patient insensible to it. It also enables the patient to take sustenance, when otherwise he would be wholly unable to swallow. As, for the most part, the spasms are reflex and excited by peripheral irritants, it might be beneficial to surround the patient with an atmosphere of chloroform or ether vapour, which may easily be done by placing a sponge saturated with it under the bed-clothes, the head being of course left out, and the clothes well tucked in around the neck. Of 43 cases of tetanus reported in the *Lond. Med. Times* (June 17, 1854), 11 recovered under the use of *chloroform*, two under that of *belladonna*, two were unsuccessfully treated by *tracheotomy*, and one recovered under the use of *sesquioxide of iron* and *Dover's powder*. In several cases *Indian hemp* seemed useful. In one, *nicotine* controlled the spasm, and repressed constitutional disturbance. In one case of *trismus* we succeeded in relaxing the jaws, and saving the patient by the continuous and persevering use of *electro-magnetism*, applied directly to the muscles of the jaw. This was a traumatic case, and brought on by the extraction of a tooth. While we are by no means of opinion that *chloroform* is to prove a *specific* for tetanus or any other constitutional form of disease, we do claim for it, in most cases of general spasms, great importance as a palliative, and for its power in subduing pain, allaying spasm, calming the general agitation, and producing sleep, besides enabling the unhappy sufferer to take suitable nourishment and other medicines, if thought necessary. The late Dr. HOSACK, of New York, trusted chiefly to *alcoholic stimulants* in the treatment of tetanus, and especially *wine*; and cases of cures by this method are recorded by him in the appendix to his edition of "*Thomas's Practice of Med.*"]

98. (*c*) *Hydrocyanic acid* was recommended by Mr. H. WARD, of Gloucester, and given in a case detailed by him, at first every half hour in cinnamon-water; and after three hours, the spasms having then been considerably relieved, it was continued every four hours, and was taken in wine. The patient ultimately recovered. Mr. CURLING states that this medicine was employed, in small doses, in three cases, all of which were fatal. It is obvious that, in small doses, but little advantage can be expected from it, and, in large doses, it requires great caution and a close observation of its effects.

99. (*d*) *Ethers* have been prescribed in various combinations, in the several forms of tetanus. The compound spirit of sulphuric ether, and the hydrochloric ether, were recommended, in conjunction with other sedatives and antispasmodics; but little benefit appeared to have resulted

from them in the acute cases, and in the sub-acute their effects were doubtful. Recently, frictions with the sulphuric or the hydrochloric ethers, or with chloroform, have been prescribed; and probably much of the benefit supposed to have been derived from this mode of using these substances has been produced by the inhalation of a portion of the vapour diffused in the air, during the use of them in large quantities in this manner.* M. MORISSEAU, in a case of traumatic tetanus, ordered the surface of the body to be assiduously rubbed with chloroform three times in the day. This treatment was continued during five days, and was attended by a copious perspiration. On the sixth day the patient complained only of general languor and debility (*Union Médicale*, 21st June. Paris, 1851).

100. The ethers and chloroform have been employed, especially by inhalation, with apparent success, both in this country and abroad, in tetanus and trismus. Nevertheless, they severally require a much more extensive and satisfactory trial in this disease than has as yet been given them; and this trial should be made with greater precision, and ought not to be limited to one or two modes of using them, but extended to the exhibition of them by the mouth, to the inhalation of them with the atmosphere, to frictions of the general surface with them, and to the administration of them in enemata. Even although they may not be the means which should be mainly confided in, they will generally prove excellent adjuvants, and will palliate the most urgent symptoms.

101. *c. Narcotics* have been very generally employed in the treatment of tetanus, especially of the traumatic form.—(*a*) Of this class of medicines, the preparations of *opium* and of its ingredient *morphia*, have been most frequently prescribed. Opinions respecting the use of opium in this disease are not only different, but even opposite. This drug is recommended in various forms of combination, by many writers: by LARREY, conjoined with camphor and nitre; by STÜTZ, with the fixed alkalies in large doses; by LATHAM, combined with ipecacuanha in the form of the pulvis ipecacuanhæ compositus; and by MARCUS in frequent and increased doses. It has been prescribed by the mouth, in enemata, and in embrocations and liniments applied externally. It has also been used conjoined with other substances, as with alkalies in warm baths; and certain of its preparations, as the aqueous solution, have been injected into the veins of persons afflicted with this malady. *Morphia* and its salts have likewise been prescribed, both internally and externally, in the several forms of tetanus, and not infrequently to a blistered surface, after the removal of its cuticle.

102. It is difficult, if not impossible, to form a correct or a precise opinion as to the effects of these preparations, or of the best modes of combining and administering them in this malady. While several authors are favourable to the use of them, others of great experience, as Sir G. MACGRIGOR and Mr. TRAVERS, consider them, if not objectionable, at least inefficient; and some writers have given opium, either in solution or in a solid state, in so enormous doses in this disease, without any very marked effect, as to induce a belief, either that the drug has not been swallowed, or that the system is insusceptible of its action during the malady. The truth, however, is, that the opium, by the excess of the dose, paralyzes the vital actions of the stomach, and it is retained in this organ without change.* Moreover, there is no doubt that it has often been given both improperly and injuriously, as respects the quantity, the modes of administration, and the previous treatment. None of its preparations should be prescribed until the secretions, excretions, or fæcal accumulations have been freely evacuated. Either of them which are most congruous with the other medicines prescribed may then be tried, in decided and frequent doses, by the mouth or in enemata, in conjunction with antispasmodics, aromatics, stimulants, or tonics, or with camphor or ammonia, or the fixed alkalies, oxide of zinc, oxide of bismuth, or with castor, musk, &c., or even with wine or brandy, according to circumstances, or when the evidence of morbid irritation predominates above that of inflammatory action in the nervous centres and their membranes. In this state or form of the malady, the endermic application of morphia may be prescribed, while other medicines, as stimulants, antispasmodics, or tonics, are liberally taken; or the fluid preparations of opium may be administered in enemata with camphor, asafœtida, spirits of turpentine, &c.

103. MM. PERCY and LAURENT (*Journ. des Progrès des Sc. Méd.*, tom. iii., p. 257, 2*d sér.*) injected a watery solution of opium into the veins, in three successive cases of tetanus, with success. This practice was adopted in eight instances, and recovery took place in five. MM. DELPECH and DUBREUIL had recourse to the injection of a scruple of the watery extract of opium dissolved in two ounces of water into the veins of a lady, aged 50, attacked with tetanus consequent upon the application of a caustic to an ulcerated os uteri. This solution was injected after three intervals of about twenty minutes each. The patient fell asleep; the pulse became full, and 70 in a minute from being 120, and the muscles were relaxed. Upon wakening from her sleep, the tetanic contractions returned, about eight hours after the injection. The operation was repeated, and was followed by the same results. The patient, however, sunk on the third day. MM. PERCY and LAURENT farther state, that they have injected twenty grains of the extract of stramonium, dissolved in half an ounce of water, into the veins of several persons attacked with tetanus, and with success. They have also injected a strong decoction of this plant with similar results; but

* The following case of inflammatory idiopathic tetanus by Dr. TIBALDI, will show the treatment employed for this form of the disease in the north of Italy: A labourer, aged 28 years, was attacked with tetanus two days after lying on the damp ground while in a state of perspiration. In pursuance of the plan generally adopted in that country for this disease, he was bled eight times during five days, sometimes to as much as twenty ounces; and above a hundred leeches were applied to the painful parts. On the sixth day, the state of the patient being still severe, Dr. TIBALDI had the loins rubbed twice with sulphuric ether; the patient was bled a ninth time, and took half a grain of acetate of morphia. The frictions with ether allayed the spasms. The next day (the seventh) he was again bled, and an ounce of ether was rubbed over the back and neck. On the following day the patient could sit up, and was soon afterward convalescent.

* [Mr. PAGE has reported a case of tetanus cured by the *Tincture of Aconite*, given to the extent of 19 minims in 8 hours the first day; on the second day, 32 minims in 14 hours; the third day, 25 minims in 7 hours; and the fourth day, 20 minims in 2 hours. The tincture was prepared according to the formula of Dr. FLEMING. (*Aconit. rad. sicc.*, ℥vi.; *Alcohol*, f. ℥xxiv.)]

the details of these cases are not furnished in the work in which this statement is made, nor is any notice taken of instances of failure. The injection of a solution of acetate of morphia into the veins of two horses affected with tetanus was tried at the Veterinary School at Alfort, but the result was unfavourable. Mr. SEWELL, of the Veterinary College, also tried this practice in a horse and in an ass affected with idiopathic tetanus. The tetanic symptoms were removed, but the animals subsequently died from other causes, but not from a return of tetanus. (CURLING, *Opus cit.*, p. 202.)

[Dr. J. W. FELL, of New York, has published (*New York Journ. Med.*, vol. 7, p. 371) the history of seven cases of traumatic tetanus treated successfully by *strychnia*. In every case, as soon as the specific twitching was produced, the tetanic spasms abated, and convalescence was rapid. He recommends it in doses first of an eighth or tenth of a grain, and then in two hours a sixteenth, reducing the dose just sufficient to produce its specific effect after each one: the great object being to produce the twitching as soon as possible, and maintain it by as small doses as possible. It is, however, proper to state that in some of the cases reported by Dr. FELL other remedies were used; as wine, opium, mercury, antimony to the spine, &c.; and that in other cases, treated by others, it has failed. *Strychnia* has been recommended by Drs. WATSON and SYMONDS in this disease, on theoretical grounds; not that it may relieve by acting on the homœopathic principle, but because it acts on the part which is evidently the seat of the disease, as the oil of turpentine often proves beneficial in the treatment of hæmaturia, though in overdoses it sometimes produces bloody urine.

It is perhaps impossible, in the present state of our knowledge, to decide whether the great tolerance of opium in this disease, as well as in child-bed fever, delirium tremens, &c., be owing to "paralysis of the vital actions of the stomach," as suggested by our author, or to the state of the nervous system—the condition of innervation—as is more generally supposed. We think it, however, by no means improbable that the function of absorption in the stomach and intestines is suspended by the paralyzing influence of immense doses of opium, though there is in this disease also an extraordinary insusceptibility to the action of the drug, as proved by injecting it into the veins. How otherwise can we account for the fact stated by Prof. WOOD, that in one instance half a gallon of laudanum and half a pound of opium were given in the space of ten days, and with impunity! But in all diseases where such tolerance is present, it should be remembered that the opium may, though it remain unabsorbed and inert in the stomach for a time, act powerfully when the insusceptibility, or the obstacle to absorption, shall cease. But it is generally useless to persevere, if the symptoms do not yield to less than poisonous doses; the cases of recovery, under enormous quantities of the drug, are too small to warrant persistence in this mode of management.]

104. Other narcotics have received, comparatively, but slight attention in the treatment of tetanus. *Stramonium* was considered of service by Dr. BEGBIE (*Trans. of Med. and Chirurg. Soc. of Edinb.*, v. i., p. 285); and *belladonna* was recommended chiefly as a prophylactic by M. SAUTER. The *Canabis Indica* was suggested, but I am not acquainted with any instances in which recovery from tetanus has resulted from its use; at least farther experience of its effects in this disease is required.

[Dr. O'SHAUGHNESSY, of India, states that he gave the resinous extract of Indian hemp in several cases of the traumatic form of this disease, at first in doses of 2 grs. every third hour, and afterward of 3 grs. every second hour, until the usual intoxicating effects were produced; when the spasms were in some cases mitigated, and in others wholly removed (see DUNGLISON'S *New Remedies*, 4th ed., p. 135).]

105. *d. Alteratives* of various kinds have been tried for this malady, and several medicines, already noticed, have been prescribed in alterative doses, especially the bichloride and other preparations of *mercury*. When the disease is attended by morbid states of the blood, more especially by acid and other excrementitious materials accumulated in the circulation (§ 52), large doses of the *fixed alkalies*, as advised by STÜTZ, or of *magnesia*, or of *ammonia*, as recommended by BLANKARD, after the bowels have been freely evacuated, will prove of service; but these should not be trusted to alone; they should be employed as will hereafter be recommended (§ 112). The preference in such cases is due to magnesia, inasmuch as it both corrects this state of the blood and opens the bowels. FOWLER'S solution of *arsenic* was prescribed by HULL, JENKINSON, HOLCOMBE, TAYLOR, and MILLER, in large and frequently repeated doses, in conjunction with opium and stimulants. The last-named physician gave ten drops of this solution every hour, with as much tincture of opium in a spoonful of brandy, in four cases of traumatic tetanus, which terminated favourably (*New Engl. Journ. of Med.*, &c., Boston, 1818). The administration of alkalies internally, in large doses with opium, and the employment, at the same time, of alkaline warm baths, although praised by STÜTZ, BEHRENDS, WILD, ELSE, and others, were denounced as inefficacious by MARCUS and FICKER.

106. *e. Antispasmodics* and *stimulants* have been very generally prescribed in the several forms of tetanus. Of these, the most frequently resorted to are, *musk*, *camphor*, *asafœtida*, *amber*, *castor*, *spirits of turpentine*,* *the ethers*, and *ammonia*, variously conjoined with each other, or with opium, alteratives, and other stimulants. AINSLIE, HUCK, ZANETTI, and others were favourable to the use of musk. CHESELDEN gave it with the tincture of opium, in moderate doses, and at short intervals. CHAPP and VOGT prescribed the same medicines, but in larger doses; and FOURNIER recommended the musk to be given with camphor. The following is nearly the same preparation as that prescribed by him:

No. 347. R. Moschi, Camphoræ, sacchari albi, āā, 3j.: Tere cum Mucilag. Acaciæ, 3vj.; dein adde Spirit. Ammon. Arom., 3ij.; Infusi Arnicæ, 3v. Misce. Capiat Cochl., j. amplum singulis horis.

Asafœtida and *castor* were favourably noticed by CELSUS, ARETÆUS, and SCHULTZ, and many others; but in modern times they have been given in tetanus chiefly in conjunction with the other

* [Dr. VALENTINE MOTT has related a case of traumatic tetanus cured by *Spirits of Turpentine* after it had resisted all the usual means. He gave a teaspoonful every 15 minutes for 2 hours, when the spasms ceased; after which it was given at more distant periods, till 123 doses were given in 36 hours.]

medicines just mentioned, or with opium, either by the mouth or in enemata. FOURNIER and PESCAY consider *ammoniacum* one of the most certain remedies for tetanus, but that it should be given in frequent doses, carried as far as half an ounce in the twenty-four hours. A successful recourse to spirits of *turpentine* has been had by PHILLIPS, HUTCHINSON, PEACOCK, and GIBBON, who prescribed this medicine by the mouth or in enemata. In either mode, as well as externally applied, it is generally of service (§ 89, *et seq.*). The *balsam of Peru* has also been administered, both internally and externally, in tetanus. Dr. KOLLOCK states, in HARLESS's Annals, that he gave as much as ʒ ij. of this balsam in the twenty-four hours, in a case which terminated favourably.

107. *f. Tonics* of various kinds, and conjoined with stimulants, or with alteratives, or with narcotics, have been frequently prescribed in tetanus, often, however, too indiscriminately, and without due reference to the form, state, or stage of the malady. RUSH considered this disease as essentially one of debility, and therefore prescribed for it cinchona, ammonia, wine, brandy, cordials, &c.; but, in addition, he directed the wound to be early opened or enlarged, and to be filled with lint soaked in spirits of turpentine, in the traumatic form of the disease. *Tonics*, *stimulants*, and *aromatics* of various kinds, and in different combinations, had been recommended by CELSUS, ARETÆUS, and others among the ancients; the most energetic in their operation was advised for tetanus by HARKNESS, PARKINSON, and BISSET. Dr. BRIGHT prescribed the sulphate of *Quina*, with other stimulants; Dr. ELLIOTSON, the *carbonate of iron*, in large doses; Dr. SMITH, the *sulphate of zinc*; RUSH, MOSELEY, PLENK, and FISCHER, the *cinchona* in powder, or in decoction. The free use of *wine* was advised by HIPPOCRATES, HILLARY, RUSH, CURRIE, and HOSACK. I can only add that these, as well as antispasmodics, or stimulants, or alteratives, or narcotics, are beneficial chiefly when prescribed with strict reference to existing pathological conditions. If the morbid irritability be characterized by debility, or by morbid states of the blood; if these states predominate over inferred inflammatory action in the membranes or substance of the spinal cord; if this action be not clearly indicated, or if it have been actively attacked by antiphlogistic measures; if the disease be traumatic or symptomatic; and if the secretions and excretions have been freely promoted and evacuated, then either of these classes of medicines, or various combinations of certain individual substances belonging to two or more of these, will be more likely to be efficacious than when otherwise employed. In these circumstances of the disease, tonics may be conjoined with antispasmodics, with alteratives, and with narcotics or sedatives, and be given every hour, or every two or three hours, according to their doses or to their effects. The following may illustrate such combinations:

No. 348. R. Potassæ Hydriodatis, ℈j.; Potassæ Bicarbon., ℈iv.; Tinct. Camphoræ Comp., ʒj.; Tinct. Cinchonæ Comp., ʒss.; Tinct. Capsici, ʒss.; Decocti Cinchonæ, ʒvjss. Misce. Capiat Cochl. ij. larga, 2dis. vel 3tiis. horis, cum aquæ pauxillo.

No. 349. R. Moschi et Camphoræ, ää, ʒj.; Extr. Belladonnæ, gr. vj. (vel Extr. Cannabis Indicæ purif., gr. xii., vel Extr. Conii, gr. xviij.). Tere cum Mucilag. Acaciæ, ʒjss., et adde Ammoniæ Hydrochloratis, ʒij.; Hydrarg. Bichloridi, gr. j.; Tinct. Serpentariæ, ʒss.; Tinct. Cinchonæ Comp., ʒj.; Decocti Cinchonæ (vel Infusi Valerianæ), ʒv. Misce. Capiatur Cochleare unum largum omni horâ, vel omni bihorio, in aquæ destillatæ pauxillo.

108. *g. Diuretics*, especially the *tincture of cantharides*, the spirits of *turpentine*, the spirits or oil of *juniper*, are said to have proved successful in cases of this disease by GARDINER, BROWN, and MEASE. The good effects of these are, however, most manifest when they have been given in such frequent or large doses as to irritate the urinary passages, or to occasion bloody urine. It has been said that the South Sea islanders, among whom traumatic tetanus is a frequent disease, endeavour to cure it by producing mechanical irritation of the urethra.

109. *D.* SUCCESSIVE AND COMBINED MEASURES.—The *Treatment* of tetanus should not consist of an empirical employment of one or more medicines, the efficacy of which has been vaunted by some writers, doubted by others, and altogether denied by not a few. It is chiefly by a *succession* and *combination of means*, carefully considered and selected, and appropriately applied to the pathological conditions of each case, as far as these may be rationally inferred from the antecedents, and from existing phenomena. Much will necessarily depend upon the stage at which the case comes under treatment, upon the cause or causes which have produced the attack, upon the circumstances connected with the patient, and the means which have been already employed. The success of treatment will mainly, also, depend upon a right interpretation of the state of the pulse, especially between the exacerbations—upon the existing vascular action generally, and locally, as far as this may be inferred, from a close investigation of symptoms, especially from the state of deglutition, from the seat and extent of the spasms, and from whatever appears to excite or to allay them.*

110. In the treatment of tetanus and of several other diseases, certain misconceptions often mislead the inexperienced physician, not the least injurious of which are the following: 1st. That bleeding will generally cure, and that it is necessary to the cure of inflammatory action; 2d. That there are no other means than this upon which any dependence can be placed capable of effecting this purpose; 3d. That all tonics, antispasmodics, stimulants, narcotics, &c., are contraindicated, or necessarily injurious, or at least inefficacious, where inflammation is present or blood-letting is required. It should therefore be recollected that, even when inflammation most unequivocally exists, blood-letting, when alone confided in, may be carried so far as to endanger life, without removing this state, especially when, owing to its seat, it occasions spasms or convulsions, or when its seat is the centre, or intimately connected with the centre, to which all impressions are conveyed and rendered objects of conscious sensation or perception, as is the case with the seat of tetanus and trismus. We accordingly find that blood-letting, when confided in alone, may be carried to the utmost, by repe-

* [Physicians have too often lost sight of this consideration in the treatment of tetanus, seeking for some *specific*, to the neglect of that combination of means which is indicated by the pathology of each case. And where the case has terminated favourably, the recovery is too often attributed to some one remedy, rather than the combination of means employed. The pathological conditions must all be regarded, if we wish to control this affection; and he will be most successful in its management who keeps this truth constantly in view, and adapts his remedies accordingly.]

tition or otherwise, in the treatment of this disease, whether idiopathic or traumatic, and yet the desired result is not attained. Nevertheless, blood-letting, largely or repeatedly, may be required and prove most beneficial, when judiciously timed and directed, especially in the idiopathic form. But it generally requires several aids to the development of its efficacy, and, in tetanus more particularly, it is serviceable chiefly by favouring the operation of other means, although these means may seem calculated to produce effects very different from, or even opposite to, those expected from blood-letting. None of these means is more beneficial in this malady than purgatives such as have been mentioned above, aided, as occasion will suggest, by croton oil or other active cathartics, and by such other of the remedies noticed above as the circumstances of the case may warrant or require, especially by terebinthinates, internally and externally, by mercurials and by antimonials.

111. *a.* The *Symptomatic* or traumatic form of tetanus is not so manifestly benefited by vascular depletions as the idiopathic, unless the patient be young, robust, or plethoric; and unless pain be experienced in the occiput, cervical or dorsal regions of the spine, or other signs of the supervention of inflammatory action, upon irritation propagated to these regions of the nervous centres, be present; and in these circumstances blood-letting, general or local, or both, should be prescribed, according to the peculiarities of individual cases, and to the effects produced. Brisk cathartics, more particularly those already recommended, followed by antispasmodics, conjoined with sedatives or narcotics; or by tonics and stimulants, selected with judgment and prescribed with decision, are generally requisite, the period of exhibiting them, and the mode of combining them depending upon the acumen and experience of the physician. In this form of the malady, the *local* and *external means* mentioned above (§ 80–89) ought to be resorted to without the least delay; and be followed by active cathartics, and the other means which the progress and state of the disease will suggest. In this, as well as in the idiopathic form of tetanus, *worms* often are present in the digestive canal, and either predispose to or aggravate the disease, more especially in warm climates, and in certain localities. Therefore the purgatives should have an anthelmintic operation, or *anthelmintic* medicines should precede the exhibition of cathartics, those already noticed being preferred, and administered by the mouth and in enemata.

112. In the symptomatic form of tetanus, where the indications of inflammatory action in the nervous centres or their membranes are hardly manifest, or are equivocal—where violent spasmodic action and continued contraction are the chief and dominant symptoms—the free evacuation of the bowels by chologogue, anthelmintic, and drastic purgatives, as already advised, ought to be the first *intention*, in connexion with the local and external measures directed above. The next should be to support vital power and resistance, and to correct morbid states of the circulation, by administering the more powerful tonics, antispasmodics, and stimulants, in such combinations with each other, or with sedatives or narcotics, or with alkalies, as the circumstances of each case may suggest. If it be inferred that the irritation has been excited, extended, or perpetuated by morbid or excrementitious materials in the blood, the free action of the excreting organs—of the bowels, kidneys, skin, &c.—should be promoted by the exhibition, either alone, or with tonics, stimulants, or aromatics, of diuretics, diaphoretics, and alteratives; of alkalies, the nitrate or chlorate of potash, the citrate of magnesia, or precipitated sulphur with magnesia, camphor, turpentine, the balsams, &c.

113. *b.* The *sub-acute* states of tetanus require similar means to those already mentioned, prescribed appropriately to the features characterizing individual cases. In these, as well as in the acute, the symptoms or signs of inflammatory action in the nervous centres or their membranes should be assiduously looked for; and if they be observed, the treatment ought to be directed accordingly. In this form of the malady, as well as in others, the most powerful agents are not always or even generally the most efficacious in arresting or controlling its course. Mild remedies, when appropriate in their operation to existing pathological conditions, especially when they are absorbed into the circulation and correct morbid states of the blood, or when conjoined with either of the several sedatives or narcotics noticed above (§ 95, *et seq.*), are often more beneficial than the most heroic, more particularly in the milder forms of tetanus, in which it is often doubtful whether these latter are more injurious than serviceable.

114. It should always be recollected that a judicious succession, as well as combination, of means is required for the cure of a disease which is so violent, so distressing, and so rapid in its course as the acute forms of tetanus are; and we accordingly find in the histories of cases furnished by writers that such a succession and combination have proved the most successful. Gilmore had recourse to blood-letting, and administered calomel with camphor, soda, and brisk cathartics, followed by tonics and narcotics. Woodford prescribed blood-letting, calomel, Dover's powder, blisters, terebinthinate enemata, and the solution of tartarized antimony in frequent doses until it produced nausea, fetid and black evacuations having been procured by means of the antimony and the turpentine injections, relief was then obtained. Several writers have observed the beneficial effects of large doses of the alkalies with opiates or other narcotics, after bleeding, purgatives, and other suitable means have been used. Dr. Smith, after the operation of purgatives, applied from fifty to sixty leeches along the spine and behind the ears; and as soon as the leeches fell off, he kept constantly applied, over the whole length of the spine, cloths wet with a strong solution of the muriate of ammonia. At the same time he administered the wine of the seeds of colchicum, commencing with half a drachm, and increasing the dose every half hour or hour, until it produced vomiting, when it was no longer given. Other authors have shown that, after a due recourse to blood-letting and purgatives, in this malady, very different means of cure may be of service, in different cases, as blisters along the spine, followed by poultices moistened by an infusion of tobacco, wine, and opium being taken at intervals; or the cold affusion on the occiput and spine, followed by warm coverings, hot wine, spices, and opiates, the affusion being continued until approaching syncope, and these measures being repeated upon a return of the

spasms; or the extract of opium conjoined with camphor and nitre, or with tartarized antimony; or the injection of a solution of a watery extract of opium into the blood, in addition to medicines otherwise administered; or the injection of a solution of tartarized antimony into the veins; or the administration, *per anum*, either of this solution, or of the infusion of tobacco, or of tobacco-smoke. A recourse to several of these more energetic means, more particularly the injection of powerful agents into the blood, and the administration of tobacco or tartarized antimony, always require the utmost caution. The effects of these should be carefully observed during a considerable time after they have been employed, in order to ascertain the propriety of repeating them, and that no time may be lost in having recourse to measures to counteract any injurious effects which may appear from them.

[In the treatment of tetanus, it is very important to bear in mind that death takes place in this disease by the exhaustion consequent on the frequent renewal of the paroxysms of tetanic convulsion, rather than from disorganization of any of the vital organs; and hence that it is essential to support the strength of the patient as much as possible by *tonics*, *stimulants*, and an ample supply of *easily digested food*, as *essence of beef*; while, at the same time, we remove all possible sources of irritation or depravation of the blood, as vitiated secretions, bad diet, impure air, and reduce the "exalted polarity" of the nervous centres to their normal condition, by means which will not greatly prostrate the powers of the patient. The secretions from the bowels, skin, and kidneys should be promoted by agents best calculated to produce this effect without exhaustion. *Opium* is not adapted to the disease; *belladonna*, *conium*, and *tobacco*, though they exert a more direct influence on the cord, are neither safe nor manageable remedies, and not unfrequently hasten a fatal termination. *Cold*, locally applied over the cord, but not so as to depress materially the heart's action, together with *chloroform* and *sulph. ether*, taken internally, promise the most success. The latter is not so powerfully depressing, and may be found, eventually, best adapted to the successful management of this obstinate affection. We cannot boast of any great success in the treatment of this disease, most cases having terminated fatally in our hands; nor have we any great confidence in the success of any of the plans above recommended. "As regards our own experience," says our judicious countryman, Dr. DEWEES, "we freely confess that we never succeeded but once in curing tetanus; and this was effected by keeping up a slight intoxication by means of hot rum punch for several days consecutively; but this remedy failed utterly in the very next case in which it was employed."]

115. *E.* THE PREVENTION OF TETANUS OR TRISMUS can rarely be entertained by the physician, as the circumstances indicating the contingent occurrence of the malady in its idiopathic form are seldom sufficiently marked, and still seldomer come under his cognizance. But it is a very important consideration to the surgeon. Much of what I have advanced when discussing the treatment of SHOCK (*see that art.*, § 19–28) applies to the prevention of this malady after severe injuries. But the chief means of prevention consist in promoting the excreting functions of the skin, bowels, and urinary organs, and in supporting the constitutional powers when these appear to languish, or are inordinately depressed by the shock, or by other causes. A dry and temperate state of the air, due ventilation, and the removal of the patient from unhealthy or miasmatous localities, or from crowded dwellings and narrow and insufficiently drained streets, are of the greatest importance in preventing the occurrence of the traumatic forms of tetanus.

116. *F.* CONVALESCENCE from tetanus or trismus requires much care as respects the regimen and medical management of the patient. The secreting and excreting functions ought to be duly regulated and promoted whenever they become torpid. The functions of the skin should be facilitated by occasional warm baths, by frictions, and by regulated exercise in an open and healthy atmosphere. The digestive organs always remain long weak and irritable, and require the use of mild tonics, with soothing or sedative medicines, as the bitter infusions with hydrocyanic acid, &c., and a light diet. As the digestive functions become restored, the more energetic tonics, or chalybeate preparations, and mineral waters, may be given, and a more generous diet be allowed.

BIBLIOG. AND REF.—*Hippocrates*, Περὶ Νοσῶν, iii., p. 491, et Περὶ τῶν ἐντὸς Παθῶν, p. 561.—*Aretæus*, Morb. Acut. l. i., c. 6.—*Celsus*, l. iv., cap. 3.—*Oribasius*, Synopsis, l. viii., cap. 17.—*Paulus Ægineta*, l. iii., cap. 20.—*Avicenna*, Canon, l. iii., fac. 2; Tract. i., cap. 8.—*Bontius*, De Medicina Indorum, cap. 3, ob. 247.—*Boerhaave*, Prælect. de Morb. Nerv., t. i., p. 70.—*L. Chalmers*, Medical Observations and Inquiries, vol. i.—*I. Clephane*, in Ibid., vol. i.—*G. Macaulay*, in Ibid., vol. i.—*C. White*, in Ibid., vol. ii.—*R. Huck*, in Ibid., vol. iii.—*W. Farr*, in Ibid., vol. iv.—*W. Wright*, in Ibid., vol. vi., art. 13.—*J. Lind*, On Preserving the Health of Seamen in the Royal Navy, 8vo. Edin., 1757.—*W. Hillary*, Observations on the Epidemical Dis. of Barbadoes, 8vo. Lond., 1759.—*C. L. Bilfinger*, De Tetano Liber Singularis, 4to. London, 1763.—*W. Watson*, in Philosophical Transact. London, 1763. (*On Electricity in Tet.*).—*R. Fermin*, Traité des Mal. fréquentes à Surinam, Mass., 8vo. 1764.—*L. Chalmers*, On the Weather and Dis. of South Carolina, p. 23.—*I. B. Morgagni*, De Causis et Sed. Morb. Epist., &c., Ep. x., art. 2; Ep. Liv. 49.—*Desportes*, Hist. des Malad. de St. Dominique, 3 vols., 8vo. Par., 1771, vol. ii., p. 171.—*D. Monro*, in Phys. and Literary Essays, vol. iii. (*On the use of Mercury in Tet.*).—*Van Swieten*, Comment., ad § 712.—*Wilkinson*, Med. Facts and Observations, vol. iii.—*T. Cochrane*, in Edin. Med. Comment., vol. iii., p. 183. (*On Cold Bathing in Tet.*).—*Bisset*, Medical Essays and Observations, art. 8.—*W. Irnka de Kerzowitz*, Commentarius de Tetanus, 8vo. Vindob., 1777. (*A standard Work.*)—*Bang*, in Acta Reg. Soc. Med. Haun., t. iii., p. 126. (*Extravasated Blood on the Brain.*)—*I. C. Starke*, De Tetano, ejusque Speciebus Præcipuis. Jena., 1778.—*G. Cleghorn*, Observat. on the Epidem. Dis. in Minorca, 4th ed., 8vo. Lond., 1779.—*Akermann*, in Edin. Med. Comment., vol. vi.—*M. Stoll*, Rat. Med., &c., i., p. 298. (*Dis. of the Spin. Cord.*)—*De Haen*, Rat. Med., &c., Pars. x., cap. 3, 4.—*G. Blane*, On the Diseases Incident to Seamen, 8vo. Lond., 1785.—*Tallmann*, in Trans. of Philos. Soc. of Philad., vol. i., p. i., n. 21.—*B. Rush*, Philosoph. Transact. of Philadelphia, 1786, and in Mem. of Med. Soc. of London, vol. i.—*Dazille*, Observat. sur le Tétanos, 8vo. Paris, 1788.—*W. Cullen*, First Lines of the Practice of Physic, vol. iii., p. 378, 8vo. Ed. 1789.—*N. Heurteloup*, Précis sur le Tétanos des Adultes, 8vo. Paris, 1789.—*J. Clarke*, Transact. of Royal Irish Academy, vol. iii., 4to. Dublin, 1790. (*The Tet. of New-born Inf. as it occurred in the Lying-in Hosp.*)—*Coxe*, in Philadelphia Medical Museum, vol. i., p. 57. (*Inflammat. of the Larynx.*)—*R. Worthington*, A Treat. on the Dorsal Spasm, 8vo. Lond., 1792.—*N. B. Nottbeck*, Dissert. de Tetano recens Natorum, 8vo. Goet., 1793.—*J. Currie*, in Mem. of Med. Soc. of Lond., vol. iii., p. 147.—*T. Dallas*, in Annals of Med., vol. iii. Edin., 1798.—*J. A. Laurent*, Mémoire Clinique sur le Tétanos chez les Blessés, 8vo. Strasb., 1798.—*Smith*, in Mem. of the Med. Soc. of London, vol. vi., art. 8.—*D. Hosack*, in New York Medical Repository for 1800.—*Portal*, Cours d'Anatomie Médicale, t. iv., p. 267.—*Ehrmann*, Nouv. Méthode de traiter le Tét. qui survient aux Plaies, 8vo. Mayence, 1801.—*J. Currie*, Medical Reports, &c., vol. i., p. 155. (*On Cold Bathing in Tet.*)—

P. Fournier, Du Tétanos Traumatique, 8vo. Brux., 1803. —*B. Moseley*, A Treatise on Tropical Diseases, 8vo. Lond., 1803.—*C. L. Mursinna*, in Edin. Med. and Surg. Journ., vol. ii., p. 255.—*D. Arnoldi*, in Ibid., vol. iv., p. 45. (*A case successfully treated by Cold Affusion.*)—*H. Briggs*, in Ibid., vol. v., p. 149. (*A case cured by Purgatives.*)—*T. Christie*, in Ibid., vol. viii., p. 415. (*Opium and Warm Bath.*)—*M. Ward*, The Efficacy of Opiate Frictions; also concerning Hydrophobia and Tetanus, 8vo. Manch., 1809.—*W. A. Stütz*, Abhandlung über den Windstarrkrampf, 8vo. Stuttg., 1804.—*J. Harkness*, in Transact. of Lond. Med. and Chirurg. Society, vol. ii., p. 286.—*J. Parkinson*, in Ibid., vol. ii., p. 293.—*E. Phillips*, vol. vi., p. 65. (*Treated by Ol. Terebinthinæ.*)—*J. Schneider*, Abhandlung über den Kinnbackenkrampf oder Kinder, &c., 8vo. Herb., 1805.—*J. Howship*, in Lond. Med. and Phys. Journ., vol. xxii., p. 186.—*L. Valentin*, Coup d'Œil sur les Différentes Modes de traiter le Tétanos en Amerique, 8vo. Paris, 1811.—*H. Holland*, Of the Dis. of the Icelanders, in Travels in Iceland, by *Sir J. S. Mackenzie*, 4to. Edin., 1811.—*W. C. Wells*, in Trans. of Soc. for Improv. Med. and Chirurg. Knowledge, vol. iii. —*D. J. Larrey*, Mém. de Chirurg. Milit. et Campagnes, 4 tomes, 8vo. Paris, 1812–17; vol. iii., p. 289.—*Marcus*, in Magazin für Therapie und Klinik, b. i., p. 26.—*J. Latham*, in Med. Transact. of Roy. Coll. of Phys., vol. iv. London.—*R. Reid*, On the Nature and Treatment of Tetanus and Hydrophobia, 8vo. Dublin, 1817.—*C. H. Parry*, Cases of Tetanus and Rabies Contagiosa, p. 18. Bath, 1814.—*N. Dickenson*, in Lond. Med. Repository, vol. i.—*D. Pring*, A View of the Relations of the Nervous System in Health and in Disease. Lond., 1815.—*J. Macgrigor*, in Transac. of Med. and Chirurg. Society of London, vol. vi., p. 449.—*D. Dickson*, in Ibid., vol. vii., p. 447.—*D. M'Arthur*, in Ibid., vol. vii., p. 461.—*J. Elioton*, in Ibid., vol. xv., p. 161. (*On Sub-Carb. of Iron in Tet.*)—*H. Earle*, in Ibid., vol. vi., p. 98.—*M. A. Burmester*, in Ibid., vol. xi., p. 384.—*W. Budd*, in Ibid., vol. xxii., p. 188. (*Remarks on the Pathology of Tet.*)—*R. Bright*, in Ibid., vol. xxii., p. 4.—*C. Grimston*, Edin. Med. and Surg. Journ., vol. vii., p. 14; and vol. xi., p. 419.—*T. Duncan*, in Ibid., vol. xi., p. 199. (*Recovery from Inject. of Tobacco-smoke.*)—*J. Hall*, in Ibid., vol. xv., p. 184.—*S. B. Labatt*, in Ibid., vol. xv., p. 216.—*J. Sanders*, in Ibid., vol. xvi., p. 474.—*J. Wayte*, in Ibid., vol. xvii., p. 394.—*J. Thompson*, in Ibid., vol. xviii., p. 44.—*W. W. Manifold*, in Ibid., vol. xxiv.—*W. Briggs*, in Ibid., vol. xxv.—*P. C. Gibson*, in Ibid., vol. xxvi.—*Chapp*, in Harless Neues Journ. der Ausl. Med. Liter., t. v. Erlang., 1806.—*J. Hull*, Edin. Med. and Surg. Journ., vol. iv., p. 245.—*Phillips*, Trans. of Med. and Chirurg. Society, vol. vi., p. 65.—*Gardiner*, Americ. Med. and Philos. Register. New York, 1814.—*Fournier*, Dict. des Scien. Méd., t. lv., p. 31.—*Chapman*, Elements of Therapeutics. Philad., 1824.—*Miller*, The New Engl. Journ. of Med. and Surg. Boston, 1818.—*Hutchinson*, in Lond. Med. and Phys. Journ. Feb., 1823.—*Chapman*, in Philad. Journ. of Med. and Phys. Sciences. May, 1823.—*Larrey*, Dict. de Méd. et de Chirurg. Pract., t. xv., p. 303.—*Lembert*, in Archives Génér. de Méd., &c. Juil., 1828.—*Berton*, Journ. Hebdom. de Med., &c. Oct., 1829.—*Gibbon*, Lond. Med. Gazette. Jan., 1831.—*Baldrin*, in Americ. Journ. of Med. Sciences. 1833.—*Smith*, in Ibid. Nov., 1836.—*Ogden*, in Lond. Med. and Surg. Journ. 1836.—*Woodward*, in Dublin Journ. of Med. Sciences. July, 1835.—*Gilmore*, Journ. des Conn. Méd. Avril, 1836.—*J. Morrison*, A Treatise on Tetanus, 8vo. Newry, 1816.—*J. W. Heustis*, in New York Medical Repository, vol. iii.—*Cross*, in Lond. Med. and Phys. Journ., vol. xxxvii.—*A. Colles*, in Dublin Hospital Reports, vol. i. (*On Trismus Nascentium.*)—*G. Bergamaschi*, Sulla Miclitide Stenica e sul Tetano, loro Identita, Metodo de Cura, e Malattie Secondarie che ne derivano, 12mo. Pavia, 1820.—*Brayne*, in Lond. Med. Repository, vol. xv., p. 1.—*J. Kennedy*, in Ibid., vol. xvii., p. 861.—*J. Copland*, in Ibid., vol. xvii., p. 375.—*Mercier et Parant*, Lond. Med. and Phys. Journ., vol. xlvi., p. 533. (*To open the wounded part, procure Suppuration, Antiphlogistica and Purging.*)—*J. O'Beirne*, in Dubl. Hosp. Reports, vol. iii., p. 343, 378.—*H. Marsh*, in Dubl. Hospital Rep., vol. iv., p. 567. (*Vapour Bathing.*)—*R. Carmichael*, Trans. of King's and Queen's Coll. of Phys., Dubl., vol. iv., p. 273.—*E. W. Roberts*, in Amer. Med. Recorder. July, 1828. (*Calomel and the act. Cautery.*)—*J. Swan*, An Essay on Tetanus, 8vo. Lond., 1825.—*H. Ward*, Observat. on Tetanus. Glouc., 1825.—*Anderson*, in Transact. of Med. and Chirurg. Society of Edin., vol. i., p. 184, et vol. ii., p. 365. (*Of Tobacco in Tet.*)—*A. Le Pelletier*, Mém. sur la Nature et le Traitement de Tétanos Traumatique, in Rev. Médicale, t. iv. Paris, 1827.—*Carron*, in Journ. des Progrès des Sciences Med., t. iii., p. 271. (*Injection of the Ganglia.*)—*Rochoux*, in Diction. de Médicine, t. xx., art. *Tetanus*.—*B. C. Brodie*, in London Medical Gazette, vol. ii., p. 345.—*J. Murray*, in Ibid., vol. xii. (*On the Division of Nerves, &c.*)—*Le Pelletier*, in Journ. des Progrès des Sciences Médicales, t. vii., p. 28, et p. 262. (*Inflam. of the Arachnoid and Pia Mater of the Spinal Medulla.*)—Ibid., p. 263. (*Case produced by the Sting of a Bee.*)—Ibid., t. ix., p. 279. (*Mielitis et alt. Rad. Anter. Nerv.*)—Ibid., t. xii., p. 94.—*Lambert*, Ibid., t. viii., p. 277. (*Endermic. Applicat. of Acet. of Morph.*)—*W. J. Holcombe*, in Ibid., t. xi., p. 260. (*Arsenic.*)—*Guines*, Archives Génér. de Méd. Mars, 1829. (*Affection of the Epigastric Centre.*)—Ibid., t. xvi., p. 219. (*Opium and large doses of fixed Alkali.*)—*Wendt*, in Ibid., t. xvii., p. 441.—*Cruveilhier*, in Revue Médicale, t. ii., p. 83. 1824.—*Gasc*, in Ibid., t. ii., p. 82. 1824. (*Phosphorus.*)—*G. Cerioli*, Annali Universali di Med. Milano. Maggio, 1829. (*Morph. Acet. Enderm.*) —*Van Dekeere*, Mém. de la Soc. Méd. d'Emmulation, t. ix., p. 477.—*Poggi*, in Archives Génér. de Méd., t. xviii., p. 406. (*Lesion of the Anterior Columns of the Med. Spin.*)—*Fritz*, in Ibid., t. xix., p. 435.—*Lisfranc*, in Ibid., t. xx., p. 130. (*Excessive Blood-letting.*)—*Peacock*, in Lancet, p. 640. Jan. 28, 1837. (*Cured by Ol. Terebinth.*)—*Cavenne*, in Brit. and For. Med. Rev., p. 228. July, 1837.—In Ibid., p. 226. Jan., 1838.—*Hamerton*, Med. and Chirurg. Rev., p. 48. July, 1837. (*Treated by Sub-Carb. of Iron*); and Ibid., p. 227; and Ibid., p. 159. July, 1838. (*Treated by Colchicum.*)—*E. Leah*, in Edin. Med. and Surg. Journ., vol. xxx.—*J. Furlonge*, Cases of Tetanus Nascentium successfully treated, in Ibid. 1830. —*J. Hancock*, in Ibid., vol. xxxv., *Ollivier*.—*J. Hennen*, Principles of Military Surgery, 3d ed., 8vo, p. 244. Lond., 1829.—*S. Cooper*, Surgical Dictionary, 6th ed., art. *Tetanus*.—*J. Sym*, Cases of Traumatic Tetanus, in Glasgow Med. Journ., vol. iii., 8vo. Glasg., 1830.—*T. Adams*, On Tetanus with Cases, in Ibid., vol. iii., p. 141.—*B. Smart*, in American Journ. of the Med. Sciences, 8vo. Philad., 1830.—*Castley*, in Lond. Med. and Phys. Journ., vol. liv., p. 197. (*Of the Dis. in Horses.*)—*R. Bright*, Reports of the Medical Cases, &c., vol. ii., p. 564, 4to. Lond., 1831.—*Poggi*, in Annali Univers. di Medicina, &c. Feb. e Marzo, 1828; and in Archives Génér. de Méd., vol. xviii., p. 406.—*J. Morgan*, A Lecture on Tetanus, 8vo. Lond., 1838.—*F. O. Doucet*, in Lancette Française. Jan., 1833. (*Cases treated by cold Affusion.*) —*J. Murray*, in Transact. of Med. and Phys. Society of Calcutta, vol. vi., p. 410.—*J. Grant*, in Ibid., vol. v., 212.—*A. Gilmore*, in Ibid., vol. v., p. 206.—*P. Roe*, in Ibid., vol. viii., p. 1.—*J. Maxwell*, On Traum. Tet. and Trismus Nascentium, in Jamaica Phys. Jour., 8vo. Jam., 1834.—*J. Swan*, On Dis. and Injuries of Nerves, 8vo, p. 348. Lond., 1834.—*Dupuytren*, Leçons Orales de Clinique Chirurgicale, t. ii., 8vo. Paris, 1834.—*J. A. Symonds*, in Cyclop. of Pract. Med., vol. iv., p. 669. —*B. Travers*, A farther Inquiry concerning Constitutional Irritation, 8vo, p. 298. London, 1835.—*R. Liston*, Lecture by, on Tetanus, in Lancet. Lond., 1835.—*Wallace*, in Ibid., 1836.—*R. Bright*, in Guy's Hosp. Reports, vol. i., p. 111, 8vo. Lond., 1836.—*C. A. Key*, in Ibid., vol. i.—*T. B. Curling*, A Treatise on Tetanus, &c., 8vo. Lond., 1836.—*R. Druitt*, The Surgeon's Vade Mecum, 5th edit., p. 14.

[Am. Bibliog. and Refer.—*E. H. Clarke*, Case of Traumatic Tetanus, cured by uninterrupted inhalation of chloroform for 24 hours; no other medicine used. Wounded with a saw Feb. 28th. Attacked March 5th. Discharged cured March 12th. Am. Jour. Med. Sciences. 1849.—*S. P. Hildreth*, Case of Spasms and Trismus from prick of needle in a female, assuming the form of hysteria, accompanied with excessive irritability, severe pains in various parts, simulating a variety of diseases, and continuing for a year or more. Ohio Med. and Surg. Jour., vol. i., p. 208.—*D. P. Philips*, Tetanic Symptoms from the use of Iodide of Potassium. Phil. Med. Examiner. 1855.—*Wm. O. Baldwin*, On Trismus or Tetanus Nascentium, and on its Identity with Traumatic Tetanus in the Adult, in Am. Jour. Med. Sci., p. 353, Oct., 1846; and in the Western Jour. Med. and Surg. for 1845. Dr. B. shows the identity of the pathological appearances in this disease and traumatic tetanus, and ascribes it to *irritation seated in the umbilical cord at the incised part*, caused by mismanagement, neglect, and improper dressings. The treatment recommended by Dr. B. is mainly *prophylactic*, consisting in the application of clean, soft, and unirritating dressings to the umbilicus, renewed every 24 hours, with great attention to cleanliness, ventilation, and the avoidance of atmospheric vicissitudes. In the commencement of the disease, free incisions are to be made in the umbilicus, and followed by the liberal application of *nitrate of silver* and bland poultices, using such remedies at the same time as are calculated to restore or correct deranged secretions.—*J. Marion Sims*, On Trismus Nascentium, in Am. Jour. Med. Sci., p. 363: 1846. Dr. S. attributes the disease to imperfect ossification of the cranial bones of the fœtus, and mechanical pressure on the os occipitis,

produced by decubitus on the back for a length of time on a hard mattress or folded blanket, with a piece of an old quilt or some old clothes wadded up and placed under the occiput, thus interrupting the flow of blood from the spinal veins, and causing congestion and ultimate extravasation within the dura mater of the cord.—*B. Rush*, in Trans. Amer. Phil. Soc., vol. ii. Dr. Rush maintains that there is *invariably* an absence of inflammation in the wound causing the disease, and advises the free use of alcoholic stimulants.—*M. A. McDowell*, Observations on Tetanus, in New Orleans Med. and Surg. Jour. March, 1846. Dr. McD. relates numerous cases where the wound had *completely* healed before symptoms of tetanus were manifested, and contends that the smallest portion of any foreign matter fixed in the substance of, or lodged in contact with, the sensitive structures, may suffice to produce the malady. Dr. McD. relates several cases of traumatic tetanus in the adult cured by free incisions into the wound or cicatrix, with free use of nitrate of silver or actual cautery, followed by bland poultices.—*Robert Libby*, Report of four Cases of Traumatic Tetanus, treated by Mercurial Salivation. (Three of the cases recovered.) Ohio Med. and Surg. Jour., p. 548. July, 1850.—*Paul F. Eve*, Case of Tetanus in which Sulphuric Ether was used by Inhalation, in South. Med. and Surg. Journal. 1849. (The patient died while under its influence.)—*N. W. Worthington*, in Am. Med. Recorder, p. 55. 1820.—*N. H. Allen*, in Bost. Med. and Surg. Journ., vol. xx., p. 165.—*C. W. Capers*, On Trismus Nascentium, in Carolina Jour. of Med. Sci. and Agriculture. January, 1825.—*W. G. Ramsay*, in Am. Jour. Med. Sci., vol. iii., N. S., p. 498.—*D. H. Storer*, Case of Tetanus following a retained Placenta, in Ibid., vol. iii., N. S., p. 97. A similar case reported in Ibid. for 1832.—*T. M. Markoe*, Tetanus from Burns from Caustic Potash, cured by large doses of Asafœtida, in Ibid., vol. ii., N. S., p. 344.—*Wm. G. Smith*, On Tetanus in Hayti, in Ibid., vol. vi.—*John W. Malone*, Case of Tetanus cured by Sulph. Quinine, in Ibid., vol. vi., p. 376.—*D. Francis Condie*, Review of Curling on Tetanus, in Ibid., vol. xx., O. S., p. 142.—*H. Dorsey*, Case of Tetanus cured by large doses of Laudanum and extensive irritation over the spine, in Ibid., vol. xviii.—*Skinner*, in Phil. Jour. Med. and Phys. Sci. 1827.—*T. G. Prioleau*, On Cold Affusion in Tetanus and Convulsive Affections, in Am. Med. and Phil. Register, vol. iii., p. 8.—*Wm. J. Holcombe*, Case of Tetanus successfully treated by Arsenic, in Am. Jour. Med. Sci., vol. i., O. S., p. 477.—*N. Chapman*, Elements of Therapeutics, vol. xi., ed. v., p. 477. Cases of Tetanus cured by Arsenic, and Review of *Bird* on Tetanus and Hydrophobia, in Am. Jour. Med. Sci., vol. iii., p. 133, 376.—*A. Foulke*, Case of Traumatic Tetanus cured by Calomel and Stimulants, in Am. Jour. Med. Sci., vol. ix., p. 100.—*W. W. Valk*, On Pathology of Tetanus, Ibid., vol. ix., O. S., p. 540.—*B. Smart*, Case of Tetanus cured by Tobacco-injections, Ibid., vol. vi., p. 337.—*G. W. Stedman*, Ibid., vol. iii., p. 244, 247.—*John Bellinger*, Case of Trismus Nascentium, in which Tracheotomy was successfully performed, Ibid., vol. vii., p. 138.—*A. C. Baldwin*, Case successfully treated by Opium, Antimony, and Tobacco-poultices, Ibid., vol. xii., p. 263.—*T. S. Kirkbride*, Ibid., vol. xvi., p. 331.—*A. Sidney Doane*, Notes to "Good's Study of Medicine," *art.* Entasia Tetanus.—*Daniel Ayres*, On Tetanus, in N. Y. Jour. Med. and Coll. Sci., vol. viii., No. 1, p. 75, N. S. 1852.—*E. P. Bennett*, Ibid., vol. vi., N. S., p. 159.—*Moses Sweet*, Cases of Tetanus cured by the division of the injured nerve, Ibid., vol. vi., No. 2, N. S., p. 194.—*Samuel Tyler*, Ibid., vol. iv., N. S., p. 204.—*John O'Reilly*, in Ibid., vol. iv., N. S., p. 295.—*D. E. Bishop*, Case of Tetanus cured by large doses of Quinine, Morphia, Wine, Beef-tea, Porter, &c., in Ibid., vol. ix., p. 201.—*H. D. Bulkley*, Traumatic Tetanus, following a simple fracture of both bones of forearm, in which amputation did not prevent a fatal result, in Ibid., vol. iv., p. 45; also vol. vi., p. 14.—*J. W. Fell*, History of seven cases of Traumatic Tetanus successfully treated by Strychnia, in Ibid., vol. vii., p. 371.—*J. B. Zabriskie*, Case of Tetanus, arising from intestinal irritation, cured by large doses of Opium, in Ibid., vol. vii., p. 169.—*S. Jackson*, Observations and Facts on the use of Tobacco in Tetanus, &c., in Am. Med. Recorder, vol. x., p. 315.—*D. M. Reese*, Case of Tetanus from a gun-shot wound, controlled by caustic issue applied to the spine, in Ibid., vol. viii., p. 548.—*B. E. Bowen*, Tetanus successfully treated by tobacco enemas, in Bost. Med. and Surg. Jour., vol. xxiv., p. 85.—*Editorial*, On Division of the Nerve in Tetanus, in Boston Med. and Surg. Jour., vol. ix., p. 96.—*M. B. Brown*, in N. Y. Jour. of Med. and Collateral Sciences, vol. ix., p. 125.—*Richard Hazeltine*, in N. Y. Med. Repository, vol. vi., p. 252.—*Frederick Dallas*, A case of Tetanus unsuccessfully treated by Tinct. Cantharides, in Ibid., vol. ix., p. 1.—*James Archer*, A case of Tetanus successfully treated by the Cold Bath, Bark, Wine, Opium, Stramonium, and Tinct. of Cantharides, in Ibid., vol. ix., p. 258.—*P. Tracy*, A case of Tetanus successfully treated by large doses of Wine and Laudanum, with mercurial inunction, pushed to the extent of causing salivation, in Ibid., vol. ix., p. 368.—*Jeremiah Barker*, A case of Traumatic Tetanus cured by Amputation and the free use of Opium and Alcohol, in Ibid., vol. ix., p. 237.—*David Hosack*, Case of Tetanus cured by Wine, Ibid., vol. iii., p. 21. (In this case three gallons of wine were taken in five days, and with the happiest effects.)—*Jabez W. Heustis*, Observations on Tetanus, and a case of the disease successfully treated with Laudanum, in Ibid., vol. iii., p. 122, 229. A very elaborate, learned, and judicious essay.—*Joshua Fisher*, in Transactions of Mass. Med. Soc., No. 11, Part i., and Med. Repos., vol. xii., p. 276. Dr. F. recommends large doses of opium in the treatment of Tetanus, and mentions one case of a young female affected with the disease who took nearly 11 drachms of solid opium in 3 days, taking 12 grs. every 10 minutes till she had taken 72 grs., "which removed the spasms, produced comatose insensibility, slow stertorous breathing, and a slow, full pulse. After an interval of 8 hours the spasms began to return, and the remedy was given as before, and with similar result." The patient recovered.—*William Harris*, A case of Tetanus cured by the Cold Bath, in N. Y. Med. Repository, vol. iv., p. 76.—*Samuel Perry*, Case of Trismus cured by Electricity, Ibid., vol. iv., p. 77.—*Richard Hazeltine*, A case of Trismus cured by Laudanum, Ibid., p. 386.—*Clark Wright*, Cases of Tetanus with Remarks, in N. Y. Jour. of Med. and Surgery, vol. ii., p. 260. In 6 cases, 3 were cured by large doses of Calomel and Opium, with Ol. Terebinth, and Brandy internally.—*Gurdon Buck*, Hospital Reports, in N. Y. Jour. of Med. and Surg., vol. iii., p. 372, 373. In 2 cases the disease yielded to the use of Asafœtida, Brandy, and Tinct. of Rhubarb, in 3 it proved unsuccessful.—*Benj. J. Raphael*, Hospital Cases, in N. Y. Jour. Med. and Surg., vol. iv., p. 109.—*J. C. Skinner*, Case of Traumatic Tetanus cured by tobacco enema (ʒss. to Oj.), in Phil. Jour. Med. May, 1827.]

THERAPEUTICS, GENERAL PRINCIPLES OF—Physic, practical Principles of—Therapeia Generalis.

1. In the article Disease I have discussed—1st. *The causation of disease, or Ætiology*; 2d. *The general doctrine of disease, or Pathogeny—the several states of Morbid Action*; 3d. *Diseases of the fluids, and more solid structures, generally originating in altered conditions of life*, especially in those previously discussed; 4th. *The connexion of Morbid Actions and of organic lesions with Morbid states of the Blood*; 5th. *The Procession of Morbid Phenomena*; 6th. *The Terminations of Disease*; 7th. *The Relations, Alliances, Successions, and Complications of Disease*; 8th. *The Mutations and Metastases of Disease*; and 9th, and lastly, I have noticed, very briefly, *the Circumstances modifying the Form, Complications, Durations, and Terminations of Disease*. This article, in connexion with those on the Blood, on Absorption (all written and published in 1831, '32, and '33), on Endemic and Epidemic Influences, on Infection, on Inflammation, and on Sympathy, constitutes a system of General Pathology to which, although many years before the profession, there is even now (1853) little of any importance to add, and in which I can find as little either to change or suppress. During this period, however, I have seen many of my ideas reproduced by others; and although I have been flattered, even by this mode of adopting them, yet I have not had the honour of their paternity assigned to me. Of this I have reasonable cause to complain.

2. Having, under the above and other heads, considered the *Causes* and *Doctrines* of diseased actions, and the *Successions of Changes* following the predisposing, exciting, and accessary causes of disease, until either recovery or structural changes, and even death, ensue; and having, in the articles Auscultation and Symptomatolo-

ey, and in others on the symptoms and signs of disease, discussed the phenomena and manifestations of general and special morbid action, it legitimately follows that the *Principles* which should guide us in attempting the removal or alleviation of disease should be as fully developed and illustrated as the scope and limits of my work will permit.

3. In the articles on Endemic and Epidemic Influence, on Infection, on Protection from Pestilential and other Maladies, and in several other places, the most important and practical parts of Public and Private Hygiene have been fully treated of. Although the *prevention of disease* does not strictly fall within the scope of *therapeutical doctrine*, yet it is so closely allied to it as to warrant a reference to those places, where it is most appropriately considered, in connexion both with the causes which require prevention and counteraction, and with the effects which result when such precautions are not taken.

4. I. Circumstances retarding our arrival at just Principles in Therapeutics.—*A. Erroneous, limited, or one-sided views of the causes, seats, nature, and procession of disease—of medical doctrine*—are among the most influential means of retarding, and even of arresting, our progress in therapeutical knowledge, and in attaining to principles which may enable us to methodize that knowledge, and to advance its progress. The empirics and dogmatists of antiquity, the humoralists of much later times, the solidists and nervous pathologists of the last century, the doctrines of Brown, the less philosophical and more limited views of Broussais, and other partial hypotheses, which never reached the dignity of being accounted theories, have set principles at defiance, and left reason out of consideration. Doctrines have been based on postulata, and what, in other hypotheses, may have been true of a species or variety, has been unjustly imputed to the genus or order. Inferences have been drawn from a few incorrectly observed facts, while assertions have been received as truths, and credulity has reposed upon them; worthless authority thus usurping the place of close observation and calm deduction.

5. *B. The neglect into which the vital endowment of the frame has fallen*, among modern pathologists, and the disposition to impute more to chemical and material changes than truly belongs to them, are also no mean causes of the retardation of the progress of sound therapeutical principles. The *vis vitæ*, the operations of Nature, constitutional power, vital resistance, &c., are terms which have been used synonymously with vital endowment; but whatever may be the name by which *vitality* should be recognised as a principle of our being—as the chief essence or principle of existence—it should always receive the first and chief consideration. Although partially or altogether neglected by many, and although results are imputed to other agents and causes which more especially belong to it, yet it on many occasions asserts its own rights, evinces its rule throughout its domain, and, whatever agents we may employ, and often even in opposition to injurious agents, it accomplishes those salutary purposes for which it is destined, and removes diseases which can be removed only by its influences. Whatever may be the object or intention with which medicines are administered, whatever the mode of prescribing them, the vital manifestations of the organ to which they are applied, or of the body generally, are more or less affected by them.

6. *C. Specious or novel plans or views, to which much greater importance is attached than they deserve.*—Novelties, specious appliances, attempts at precision which cannot be reached, and various methods recommended by cunning persons to serve their peculiar purposes, and quickly caught up in order to serve the same ends, or to show extended information, severally tend to retard, and even to mislead, the march of therapeutical knowledge. The recent vaunting of the importance of medical statistics, and of numerical methods of proving the seat or nature of particular maladies, or the efficacy of particular remedies or plans of cure; undue values put upon therapeutical agents, plans, or systems; the vain parade of imported articles of medical belief, even although they may rank no higher than specious absurdities, are all impediments in the way of truth. A physician who has obtained by accident, by connexion, or by talent of some kind, a position in his profession, asserts that a disease, or class of diseases, exists in certain numerical proportion, or presents numerically certain pathological changes or phenomena; and that the success of particular remedies or plans of cure may also be valued numerically as respects that or other diseases. The assertion, although so fallacious as to be almost absurd, yet being made by a physician of reputation or position, is believed, paraded as an astonishing novelty, and as an undisputed truth. Yet no hypothesis connected with medicine is more erroneous, inasmuch as there is not one disease which is always the same in all its features, in all places, or seasons, or times, or which is identical as to its precise seat, nature, or vital and material relations and associations. As there is not a single disease in the various and ever-varying states of climate, of causes, of duration, of endemic or epidemic influences, of constitutional peculiarity, &c., that is identically the same, attempts at a numerical precision must necessarily be fraught with error, and be productive of most injurious results; the specious appearance of a precision which the nature of the subjects to which it relates cannot reach, or even approach, misleading those who prefer authority to deep thought, and a striking novelty to close observation.* This is

* There cannot be a more absurd belief than that confided in by some recent writers, who have adopted the numerical method not only of describing the causes and symptoms of any particular disease, but also of treating such disease. Thus our Continental brethren, and our domestic imitators, having assumed that the disease is pneumonia, or pleuritis, or peritonitis, or any other specific form, without noting the influences of climate, season, age, constitution, endemic or epidemic conditions, duration, complications, &c., are not content with informing us that so many in the hundred presented a certain symptom, or proceeded from a particular cause, and that another number in this hundred furnished different results; but they go even farther, and, endeavouring to enlighten us still more, tell us that a certain number per cent. of a certain disease was cured by one medicine, another certain number was cured by another medicine, the one which cured the most being *the* remedy for that disease; as thus most irrefragably proved by this most admirable statistical or numerical therapeutical method! Let me take a recent illustration of this most admirable method, as furnished by a most distinguished medical *savant*, somewhere between this and the Black Sea. He takes a large number of cases of a disease which he has assumed to be, or is pleased to call, *pneumonia*, but of the truth of which we have no evidence, and none whatever of the causes, of the characters, of the duration, of the morbid associations or com-

only one of the several specious plans or novelties which the love of notoriety, or the desire of distinction, has thrown out to the credulity of the multitude, each one having its own crowd of believers until another supersedes its supremacy for a time, until it, in its turn, sinks under the influence of a successor, the revolving wheel of time at last turning up anew the theories, the plans, and the beliefs of past ages.

7. *D. Wrong estimates of the efficacy of particular medicines and agents* are as influential in retarding the progress of therapeutical principles, as the adoption of erroneous doctrines of the causes, seats, or nature of disease. Therapeutics is based equally on sound pathological principles, and on a knowledge of the operation and efficacy of medicine—of the instruments which we employ for the removal of morbid conditions. It requires not the lapse of many years to show the experienced physician the perishable reputation of many of the agents which have been employed against disease. Worthless agents have often been adopted; means which possess little influence have been over-estimated; and others, which are efficacious when judiciously used, have sunk below their true value, or even fallen into disuse. Fashion, undue estimates, improper and irrational employment, have contributed their respective shares in retarding our knowledge of therapeutical agents, and in preventing us from accomplishing therapeutical intentions. The same revolutions which have taken place in respect of medical doctrines during many centuries have likewise taken place as to therapeutical agents; the vanity of some, the cupidity of others, and the sanguine or enthusiastic views of a few, leading those into error who trust to authority, and who are deprived of the means or the powers of original research and profound observation.

8. *E. The license allowed by the laws to charlatans, impostors, and systems of imposture*, and the credit which these obtain with the public, owing to the confidence of their assertions and the false testimonies they produce in support of their delusions, are injurious to the progress and reputation of scientific medical practice. The cure of disease being essentially a most important and high profession, all who pretend to it receive from the public an amount of notice great in proportion to the parade, rather than to the justice of their pretensions. Hence the high standard of medical profession is lowered, and every pretender, while he detracts from this standard, derives to himself a reputation with the credulous public which is altogether opposite to his deserts. These impostors, by assuming characters which do not belong to them, and which the negligence of the Legislature, and the worse than negligence of the expositors of a most imperfect legislation, not only permit, but even encourage, by thereby lowering the prestige of medical science, and by diminishing the amount of encouragement held out to learning and science, actually retard the progress of scientific research, of professional learning and observation, and consequently of practical medicine.

9. *F. But the most remarkable cause of the slow progress of therapeutical science is to be found in the highest and most legitimate ranks of the medical profession—in physicians themselves.*—Public institutions for the cure of disease, in very few instances in this country, and even these only in recent times, have furnished the amount of knowledge to the profession which they are calculated to furnish; and many of those who have been engaged for the greater part of their lives in treating the diseases received into the wards of these hospitals, have gone to their graves either without having thrown any light upon the obscurities of pathology and of therapeutics, or, if any such light had broken in upon the darkness of their mental vision, it had never been reflected to others, or enlivened the gloom in which they had shrouded their ignorance. Other physicians have enjoyed the patronage not only of the public but also of their profession, and must have had their minds stored—if, indeed, capable of obtaining and retaining such stores—with pathological and therapeutical knowledge, and have sunk into the tomb without furnishing a single fact, precept, or opinion by which their names could be rescued a single day from their deserved oblivion. Thus the springs of therapeutical science have either been dried at their very sources, or have been absorbed by the barren and sandy soils through which they had most unfortunately passed. Others, with a more determined selfishness, reserve to themselves, and to their own uses, and for their prospective gains, the results of the experience they may have reached, and of the researches they may have made; and, without reflecting that the attainment of knowledge imposes the duty of imparting that knowledge to others, as a grateful return for the kind Providence of attaining it, do all in their power to turn it to their own advantage, and to prevent it from coming before the profession or the public. This last cause, however, of the retardation of therapeutical knowledge is much less remarkable than formerly, and is rarely to be observed at the present day.

[The above remarks are specially applicable to many of the practitioners in our own country, who are connected with hospitals and other public institutions where valuable experience may be

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plications, &c.; no proof whatever whether or not they were cases of sthenic, or of asthenic or congestive pneumonia, or of broncho-pneumonia, or of peripneumonia. He represents these numerous cases as pneumonia, although it is well known that pneumonia presents very different and even opposite features, and conformably with such features requires very different and even opposite means of cure—means varied and appropriate to each case and to each state and stage of the malady. But the enlightened and illustrious therapeutist makes short work of his numerous cases. True to his faith in numbers—to his infallible "numerical method," he divides his devoted, although numerous cases, into three equal parts. These three equal numbers—these three forlorn hopes, which thus are led to storm the stronghold of scientific and rational medical practice—are each very differently treated: one devoted third is treated by blood-letting alone; another devoted third, by tartar emetic only; and a somewhat more fortunate third, is left entirely to the unaided efforts of Nature. Can there be any doubt of the result, when we know well that many cases of pneumonia, instead of blood-letting, or tartar emetic, in which cases these means are certain destruction, require camphor, ammonia, and other remedies very different from those he has experimented on? What this empyrical admirer of the "numerical method" inferred, when he found that Nature was the best doctor, may not be manifest. But she is undoubtedly very greatly to be preferred to the *soi-disant* physician, who treats disease according to the name he chooses, often irrationally, to give it; and without adapting or combining his agents in such modes as an enlightened physician would employ and direct them to the removal, the counteraction, or to the relief of such existing morbid actions as pathological science would enable him to detect and estimate with due accuracy.

acquired. A vast majority of such rarely, if ever, publish to the world the results of their experience, and the only persons who profit by their advantages are themselves. Such physicians should bear in mind that those institutions are not only designed to aid the sick and suffering poor, but also to aid in the accumulation of medical experience, in order to the advancement of medical science. Such practitioners should not expect to enjoy the patronage of the profession unless they share with them the facts and the knowledge acquired by their greater advantages.]

10. *G. The want of correct ideas as to the physiological action of remedies* is one of the most powerful causes of the retardation of therapeutical knowledge. It is obvious that, even when the causes and nature of a disease are clearly indicated and recognized, if the physiological action, the *modus operandi* of the agents prescribed be not accurately known, the indications of cure cannot be successfully fulfilled, unless, indeed, the vital resistance of the frame be such as overcomes the injurious or wrong-directed means. Hence the propriety, as will be shown in the sequel, of ascertaining with precision the true action of the means employed—of using aright the instruments of cure.

11. *H. The prejudices, also, of those who are submitted to medical treatment, and the neglect of others*, although chiefly preventing the success of treatment, likewise retard the advance of this department of medical science. Many persons submit to treatment to satisfy their friends, without belief in its efficacy, or at least with a conviction that medical care cannot avert their fates, or change the decrees of Providence, not knowing, or not believing, that the means are required to be used by us before the blessing of the Almighty can be accorded to them; and that those are most certainly aided by Divine power who use every endeavour to aid themselves, while those who mistrust their own, and other human efforts, most frequently reap the fruits of distrust and unbelief. The neglect of patients themselves, although confiding more or less in medicine, to follow out with care the injunctions of the physician as to its use, and as to diet, air, exercise, and regimen, often mislead him as to the operation and the success of the means which he has prescribed, and induces him to attribute either too little or too much to their influence.

12. *I. Medical jealousies and contentions; opposing systems, plans, or means of cure; jarring views as to the efficacy or operation of certain medicines; opposite opinions in courts of justice, or otherwise appearing in public; the publicity given to medical discussions*, especially when different views are warmly espoused, have severally and collectively an unfavourable influence on the public, especially at the present day, and prevent many from trusting to medical treatment, at least for such a period as is requisite for their cure. These circumstances induce many to have recourse to charlatans, whose confidence and assurances impart a similar sentiment in them. The impatience, also, of those who ought to be patient; the frequent changes of their medical advisers, and the consequent discordance of their views and of their means of cure; the recourse to new plans or agents before those previously employed had received due trial, or their effects observed, together with various other circumstances depending upon both physician and patient, and with the too frequent incongruity of the means prescribed, not merely retard or prevent the recovery of the patient, but also exert a similar influence on the progress of therapeutical science.

13. II. The Principles of Therapeutics.—My limits prevent me from noting the earliest attempts to develop the principles of therapeutics, or the more recent efforts at a satisfactory arrangement of these principles. The reader who is desirous of satisfying himself as to these matters may do so by referring to the works enumerated in the Bibliography. Without adopting, or in any way following, the methods of others, I shall draw upon my own resources, and state what extensive observation and prolonged experience have induced me to believe. Although on this, as on many other occasions, I furnish the references for those who choose to have recourse to them, yet the opinions or doctrines which may be there found, and those which will be here enunciated, if they agree at all, or in as far as they agree, may be viewed as accidents or coincidences, and as evidences of their truth, rather than that I have been indebted for them to any of the sources there indicated.

14. i. Fundamental Principles of Therapeutics—The essential Basis of Therapeutics.—*A. To endeavour to interpret aright the operations of Nature, and not to interfere with them when their procession is conducive to the removal of morbid states, or to a return to health, but to aid and to develop them when aid is required.*—This precept is evident to all observing and experienced minds; but it is not always adopted by the inexperienced. When a person is seized with epistaxis, or with vomiting, or with diarrhœa, or with a hæmorrhoidal discharge, inexperience may attempt to arrest it, and thus to change a salutary evacuation to a dangerous malady. If these were duly watched, the effects carefully observed, and allowed to proceed, either until they subsided spontaneously, or until it became obviously requisite to arrest them, cerebral congestions and determinations, hepatic obstructions or congestions, or other serious affections, which often follow upon their premature arrest, might be averted. It not infrequently occurs that either of these discharges, especially when scanty, or insufficient to produce a salutary effect, points the path which should be taken. Where Nature directs, we should follow; and, although her steps may not be exactly those in which we should always tread, the principles she inculcates ought to be adopted, and carried as far as an enlightened experience or a reasoning observation will warrant.

15. *B. We should next endeavour to ascertain the causes, the mode of accession, the duration, and the extrinsic and intrinsic circumstances influencing the progress of the disease.*—*a.* It is obvious that the nature of the *cause* will always most materially influence the state, course, and termination of the malady. The cause often becomes identified with, and forms, as it were, a portion of the constitution of the disease. A poisonous seminium, emanated from an infected person, impregnates the frame of another, imparts a specific character to the resulting malady, in all its successive and spreading disseminations. Malaria invades the frame, and produces effects commensurate with the concentration or dose of the poison and the susceptibility of the individual.

The inflammations resulting from the more usual causes of suppressed perspiration, or of interrupted eliminating processes, manifest different features from those which result from special animal emanations or other poisons: while the former are more or less sthenic or limited, the latter are spreading, erysipelatous, contaminating, or infectious. (See *arts.* ENDEMIC and EPIDEMIC INFLUENCES, ERYSYPELAS, INFECTIONS, POISONS, &c.)

16. *b. The mode of accession* is often an index to the future character and course of the malady. If the accession is clearly connected with the cause, and such as the cause usually produces, both the nature and the treatment of the disease are often clearly indicated. Thus, if a person experiences chills or rigours, but complains of no remarkable pain or other affection of an organ lodged in any of the cavities, although there be pains in the head, back, and limbs, and if he can trace his disease to exposure to any of the usual sources of malaria, either intermittent or remittent fever may be considered as having commenced; and if, after such rigours and such exposure, heat of skin, vascular reaction, and the other usual symptoms of febrile excitement be present, the nature of the malady becomes still more manifest, although a farther time, probably only a very few hours, may be required to demonstrate the type of the malady. In such cases, an emetic, followed by a chologogue purgative, and by free evacuations, and these, at the due period, by a powerful dose or doses of quina or of cinchona, &c., will make a salutary impression on the frame, will break the chain of morbid actions, and prevent the succession of febrile paroxysms. This connexion of the cause with the accession of the disease it produces is still more remarkable in respect of specific and infectious maladies, and often not less so as regards endemic and epidemic diseases, and often furnishes a sufficient basis for therapeutical intentions.

17. *c. The duration of the disease*, when the physician is first called, and the previous history of the case, obtained with all possible precision, are essential to a proper treatment of it. The stage at which it has arrived; the existing pathological conditions, as far as they may be traced; the probable degree of vital power or resistance; the evidence as to the state of the blood and of the depurating organs and functions; and the means which have been already employed, and the effects produced by them, should be severally estimated with all the accuracy in our power. It is obvious that, as disease is generally a succession of morbid actions, leading either to the restoration of health, or to exhaustion of vital power and deterioration of the fluids and structures, so should the progress in either direction be carefully considered, and the indications and means of cure directed accordingly.

18. *d. There are numerous intrinsic and extrinsic circumstances influencing the character and tendency of a disease* which ought to be duly considered by the physician, inasmuch as a recognition of these, and a careful estimate of them very often, should direct or modify both the indications and means to be adopted. I can merely enumerate these circumstances at this place, as a more full consideration has been given them under different heads. The several *epochs of life*, from infancy to extreme old age, not merely have diseases which are especially incidental to them, but also very remarkably modify the features and tendencies of those which are common to all ages (see *art.* AGE). The *temperament* and *habit of body*, particularly as respects vascular fulness and inanition, or anæmia, are of great importance, as I have shown in the article BLOOD (§ 13–77). *Varieties of the human species* and *differences of race* very remarkably influence not only the predisposition to, but also the treatment of, many diseases, especially those of a febrile, inflammatory, and epidemic nature; and when individuals of any variety or race have migrated from a climate in which they were indigenous, to one more or less different in the several physical elements and circumstances which constitute *climate*. The pathology and treatment of diseases, with reference to difference of race or variety, was for the first time duly considered in this work. The *occupation* of the individual not only induces many diseases, but also modifies others. (*See* ARTS and EMPLOYMENTS, &c.) The *habits* and *mode of living* usually adopted by the patient both modify the character of many of the diseases to which he is liable, and require modified indications, means of cure, and regimen. They are even productive of several others, as fully shown in the article on DISEASE (§ 18, *et seq.*). In addition to these, certain DIATHESES and hereditary diseases should not be overlooked, and, of the former, the SCROFULOUS, the GOUTY, and the RHEUMATIC are the most important.

19. *Mental impressions, emotions*, &c., have a powerful influence in modifying, as well as in predisposing to disease; and this influence is very generally exerted during the whole course of the malady, favouring, and sometimes even occasioning, an unfavourable or a favourable issue, according to the nature of such impressions or emotions. These affections of mind ought always to be duly considered by the physician before he forms his indications or selects his means of cure. In severe, dangerous, and infectious maladies, the patient often entertains anticipations of the result, which occasion their own fulfilment. When these anticipations are unfavourable, and especially when they amount to convictions in the patient's mind, then they should be combatted not only morally but physically. They should even direct the indications and the means of cure, the most powerful remedies being then required to rouse the vital powers and resistance, to arrest exhausting discharges, when these are present, and to restore the depressed energy of the organic and cerebro-spinal nervous systems. Several slighter and more chronic maladies either are rendered more severe, or are prolonged, by mental disquietude or anxiety—by some cause depressing or irritating the sentiments, emotions, and passions. The mental condition and circumstances of the patient should, therefore, be ascertained, when the state of disorder indicates any disturbance in this direction, and ought to be directed accordingly.

20. *Several extrinsic influences* modify the character, nature, type, and terminations of disease, not merely in as far as they are the occasion of it, but chiefly by the impression they make on the frame during the course of the malady. *Climate* remarkably affects the prevalence and nature of many diseases, and requires that the indications and the means of cure should be directed and modified accordingly; and with reference not merely to those persons who are indigenous

and acclimated, but also to those who have recently undergone a change of Climate. (*See that article.*) Endemic and Epidemic Influences (*see these heads*), confinement in an infected atmosphere, or in crowded or ill ventilated apartments and localities, emanations from burying-grounds, sewers, drains, cess-pools, or water-closets, and the numerous sources of atmospheric contamination described when treating of the causes of Pestilence and of the means of preventing it, severally not only produce disease, but aggravate its character when the patient continues to be subjected, during its progress, to any of these causes.

21. *States of weather* and *season* have also great influence upon the course of diseases, certain ranges of temperature favouring the occurrence of some diseases, or even being necessary to the diffusion or to the infection of others, especially of infectious, pestilential, and epidemic maladies. The influence of season, weather, winds, and, more especially, of ranges of temperature, not merely on the diffusion of disease, but also upon its general character, is so well known that it is unnecessary to furnish any illustrations of the fact at this place, as they are fully adduced, under their respective heads, when treating of the maladies chiefly influenced by these causes, and in the articles Disease, Infection, &c., and in those just referred to.

22. Among other influencing extrinsic causes, the *prevailing epidemic constitutions*, as well as those just mentioned, and generally in connexion with them, require strict attention when forming the indications, or selecting means of cure. These epidemic constitutions often continue many years, and the prevailing diseases present either a high range of sthenic diathesis, or a general asthenia, or depression of vital resistance to the progress of morbid changes. In the former the character of diseased actions is sthenic, inflammatory, and recuperative; in the latter it is adynamic or deficient in vital power. The sources of these prevailing constitutions have not been satisfactorily shown. They have been imputed to a prevailing character of the seasons, to the annual amount of rain fallen during a series of years, and to the states of terrestrial and atmospheric electricity—to either or all of which they may be referred, although the proofs respecting them are not quite conclusive; and are not sufficient to exclude the influence of other, or even of unknown agencies.

23. *C. To determine the pathogeny of disease—to ascertain existing pathological conditions, and the morbid tendencies characterizing them*, is the chief basis on which indications of cure should be founded. This is the great *axiom* in rational therapeutics, and, unless due regard be paid to it, medical treatment is worse than empyrical—it is often destructive of life—it entirely subverts its own intentions. This being the case, the utmost care should be taken to arrive at accuracy respecting these conditions, and as to their several tendencies and consequences if they be not arrested or controlled. Due consideration ought likewise to be given to those topics which have been already discussed. The existing pathological states having been rationally inferred from every fact and circumstance connected with the disease, and from its causes and modifying or accessary influences, the indications and means of cure should be appropriately directed to remove, or to control, or counteract them, according to their natures and tendencies, as shown in the more *special principles of therapeutics* (§ 36, *et seq.*), and fully illustrated in the consideration of the specific forms of disease, under their several heads.

24. *D. To remove all predisposing, exciting, and concurring or accessary causes, as far as may be in our power*, is obviously necessary to the removal of the effects resulting from these causes. The causes of disease, especially those which are exciting or most influential, are often so obvious, and their connexions with their effects are so demonstrative, that the existence of the former leads us to infer the latter; and a due manifestation of the latter is indicative of the former. This is especially the case in respect of specific, infectious, contagious, febrile, endemic, and epidemic maladies. But there are other diseases which are the effects not of one or even of two causes merely, but of several. There are numerous circumstances which influence, by predisposing or by counteracting, the susceptibility of the individual to the invasion of the exciting or efficient causes of disease; while there are many more which concur or reinforce these causes, either at the time of, or subsequently to, their morbid impression and action. Some of these may escape detection or due estimation, while others may have an undue importance assigned to them. Still it should be our strenuous endeavours to ascertain their existence and influence with due precision, in order that they may be removed or counteracted.

25. ii. General Therapeutical Principles and Precepts.—*A. Of indications and contra-indications in the treatment of disease.*—Indications or intentions of treatment or cure are those objects or ends which we propose to attain, in order to remove altogether, or to alleviate disease when removal is no longer attainable, owing to its nature or progress. Contra-indications are such intentions or means which would, reasoning from existing phenomena and pathological states, either not remove or benefit these states, or would aggravate them, and thereby risk the life of the patient. Indications of cure are to be accomplished or fulfilled appropriately and successively, by a careful and accurate deduction from existing morbid conditions and tendencies, and with a strict reference to the fundamental principles noticed above, to facts, and to the considerations and reasonings which accurately observed facts suggest. Having observed with care and acumen, and drawn rational indications from a close and comprehensive view of both the intrinsic and extrinsic circumstances of the case, the next object is—

26. *B. To employ agents or means—remedies or medicines—for the fulfilment of those indications or intentions that are the best calculated to this end.*—But to attain an object, to accomplish an intention, it is most requisite to entertain accurate views as to the mode of action, the proper methods of employing, and the efficiency of, the agents, instruments, or means which we may recommend. The physiological action of medicines, in different doses or quantities, ought to be known, and the operation of the same medicines and doses be ascertained, in different diseases, by a careful experience and close observation. Having previously known the modes in which agents or means become remedial or in-

strumental against disease, those agents or medicines should be employed with strict reference to the removal of existing morbid states, as far as they may be ascertained, and with the intention of preventing progressive disorder, a strict regard being always had to the physiological and pathological operations of these medicines or agents.

27. *C. To closely observe the states of vital power and resistance, and the grades and character of vascular action, in connexion with the condition of the circulating fluids and of the several secreting and excreting functions.*—Our means should always have regard to the vital manifestations, recollecting that agents become remedies only when acting on vital states, and appropriately to a correct interpretation of these states—when they calm or lower vital excitement or morbidly increased vascular action, if either of, or both these pathological conditions are present, and when they restore vital power or impaired vascular action, if either of or both these states require restoration. But it is not only necessary to attend to the grades and character of vital power and of vascular action and reaction; the conditions of the circulating fluids, and of the secreting and excreting organs, should be ascertained with all possible accuracy. The condition of the circulating fluids, especially of the blood, can often be inferred only from the activity, from the torpor, or from the suppression of one or more of the eliminating or depurating functions, and from the appearances of the skin, extremities, and the outlets of mucous canals; it may be farther inferred, on many occasions, from the states of the heart's action, and of the pulse, in connexion sometimes with the appearances and the changes of the blood itself, when taken from a vein. Whatever may be the changes, the signs, or the phenomena which may guide our inferences as to vital power, or to vascular action, or as to normal or anormal conditions of the fluids or solids, these inferences having been rationally drawn, the indications of cure conclusively follow, and are to be fulfilled by medicines selected conformably with their known operations.

28. *D. To take into consideration not merely the states of vital power, of vascular action, and of the excreting and depurating functions, but also the diathesis, the general aspect, the complexion, the posture, the nutrition, and the physical power of the patient.*—In addition to these, the circumstances in which the patient is placed, and by which he is influenced, whether mental or physical—whether intrinsic or extrinsic—should be duly estimated conformably with the influence they may severally or collectively exert in favouring, or in counteracting the indications and the means of cure; and these means should be selected with due reference both to these indications, and to these moral and physical circumstances which are never present without influencing, more or less, the present condition, and the course and the terminations of the disease; and, moreover, without modifying the effects of remedies.

29. *E. To select the means of cure with strict reference to what is known of their modes of action, and, conformably with this knowledge, to employ them appropriately to inferred pathological conditions.*—Medical agents are remedial only as they are rationally or appropriately prescribed. In order that they may be so employed, it is requisite to bear in mind the following propositions: 1st. That medicines should be given in forms which may best produce their desired effects; 2d. That the vehicles in which they are given should also possess this property; 3d. That the substances with which they are associated ought to be such as either will develop their effects or will concur in producing the same effects; 4th. That substances which act upon more than one function, surface, or viscus ought to be cautiously prescribed, and with especial reference to the function or viscus on which their operations are desired; 5th. That when medicines are likely to occasion nausea, pain, or distress, these effects should be avoided by combining them with substances which may prevent or correct such discomforts; 6th. That when it is desired to influence more than one organ or system, agents whose actions have been shown to be thus complex may then be selected with these intentions, or several may be conjoined with these views, provided that they are chemically compatible, suitable to the ends proposed, and altogether congruous with each other; 7th. That the combination of medicine producing different effects often occasions additional effects, different from those produced by either, and frequently without materially disturbing the action proper to each. These propositions, although almost self-evident, require a few remarks for their elucidation. My limits, however, require that these remarks should be very brief.

30. *a.* The form best suited for the production of the effects of a remedy, is that which conveys either all, or the greatest amount, of the properties characterizing the remedy, and which presents these properties in the most suitable state for their immediate or for their more protracted operation, as either may be required. Thus the more immediate and full operation of medicines is most frequently obtained by infusion or decoction, by dilution, or in the state of tincture or essence, according to the nature of the substance; or by trituration or minute division, if the substance be more or less solid. In the states of solid and extract, or in the form of pill, many substances either may long remain in the stomach without being acted upon, or may pass the pylorus, and either occasion a very delayed or a very imperfect effect; and when pills are gilded or silvered, their operation may be still longer delayed, or they may pass off without being dissolved. When the operation of medicines upon the lower bowels or uterus is desired, then the form of substance, extract or pill, may be preferred.

31. *b.* The vehicles best suited for the administration of active medicines should be congruous with the operation of these medicines, and such as may prevent the stomach from being disturbed by them, and at the same time promote their operation. Thus the action of the disulphate of quina is promoted by taking it in the compound infusion of roses; the tinctures of cinchona, in the infusion or decoction, or in an aromatic water; the several tonic tinctures, in bitter and aromatic infusions; and the purgative tinctures or salts, in laxative or purgative infusions; neutral salts, in states of much dilution; powders, in aromatic infusions or waters; and the active ingredients for enemata, in vehicles which will admit of their administration in due or equal admixture.

32. *c.* That several substances whose effects are congruous, or calculated to develop their mutual actions, are often most beneficially prescribed together, cannot be controverted, especially in cases requiring a decided operation on the secreting and excreting organs, and a due development of the several vital manifestations. Thus various purgative or cathartic substances are combined with advantage; several stimulants, with antispasmodics; tonics, with stimulants and aromatics, &c. Quina, or the disulphate of quina, is advantageously given with camphor, in many cases requiring the former; or cinchona with ammonia, or with serpentaria, or with both; or myrrh with asafœtida, galbanum, or ammoniacum; or infusion of valerian, with tincture of sumbul, or with ammonia, or the ethers; the preparations of iron with those of quina, or with those of calumba or quassia; the preparations of scoparium, with those of taraxacum, juniper, &c., or these with the salts of potash, &c., or with diuretic spirits or tinctures, &c.

33. *d.* It is often desirable to have recourse to substances which affect more than one function, or to combine medicines which affect different organs, due regard being had to the function requiring to be chiefly acted on. Certain medicines, particularly those which are alterative, and more or less specific in their operations, produce, according to their doses, the frequency of their repetition, and the nature of the disease, changes in more than one organ or function. Mercurials, antimonials, iodine, and the iodides, sulphur, magnesia, and the alkalies, &c., may be adduced in illustration of this position. While sulphur acts on the bowels, it is partially absorbed into the blood, and acts also upon the skin, increasing both the cutaneous exhalation and the follicular secretions. Magnesia opens the bowels, is partially absorbed, and neutralizes and counteracts excrementitial materials in the circulation. Alkalies and the iodides combined with the alkalies, affect the blood, and through it the several emunctories and solids. Camphor passes into the circulation, affects the nervous system, and promotes exhalation from the lungs and expectoration; the terebinthinates also are absorbed, and act upon the capillary circulation and on the kidneys, &c. Many of the neutral salts act upon the bowels, and being absorbed, especially when taken in doses which are not purgative, excite the kidneys to increased action, and sometimes also the skin, &c.

34. *e.* The action of medicines may cause discomfort or painful symptoms, which should be prevented or counteracted by adding substances which will correct these unpleasant effects. Purgatives, especially those which are cold, saline, or nauseous, and substances which in large doses occasion vomiting, frequently are rendered both more pleasant and more active, by conjoining them with aromatics, or with spices, or with bitters, or with both, and sometimes also with anodynes or narcotics; or by giving them in finer divisions, or in more diluted states, either similarly combined, or in smaller and more divided doses.

35. *f.* Medicines possessed of different properties may be conjoined, when it is desirable to affect more than one function, organ, or system; provided that the action of the one substance does not counteract that of the other, and that they are chemically and vitally compatible with each other. Thus the alkalies, the combination of them with boracic acid, or common borax, the nitrate of potash, magnesia, and the citrate of magnesia, severally change the states of the blood, especially when uric acid or the urates and fibrin are in excess in the blood, or when this fluid is loaded with excrementitial materials. They neutralize these materials, and promote their removal by means of the emunctories; and, when they are conjoined with tonics, or with febrifuges, or with bitter infusions, they promote the salutary effects of those, especially in periodic and low fevers, more particularly when they are given in the decoction of cinchona with serpentaria, or with camphor, arnica, &c. Those deobstruent and alterative substances, or the iodide of potassium, with the solution or the carbonate of potash, and with the tonics now mentioned, are also most beneficial in several states of rheumatism and gout, in some diseases caused by malaria, and in several other maladies, chiefly owing to the combination of means and to their conjoint actions.

36. *g.* The combination of medicines possessed of different properties often gives rise to different or to additional effects, those characterizing each either still appearing, or being masked by the effects resulting from the combination. Sometimes the effects are a combination of those produced by each ingredient, as when tonics are combined with aperients or purgatives. The true Dover's powder, or the association of ipecacuanha and opium with the nitrate of potash, produces an effect beyond those which characterize these constituents; yet their individual properties are more or less manifested. Disulphate of quina, conjoined with one tenth of the quantity of aloes which is usually required to open the bowels gently, produces a cathartic operation. Small doses of opium tend to determine the action of medicines, which are apt to disorder the stomach or bowels, to the skin or to the kidneys, as when they are conjoined with antimonials, or with ipecacuanha, or with colchicum, or with the common diuretics.

37. III. Special Therapeutical Principles.—The special consideration of therapeutical principles has been partly discussed under other heads; but it may not be without advantage to bring the whole subject, in a full and connected manner, before the reader, referring him to those places in which certain topics are as fully considered and illustrated as the scope and limits of this work will permit, in order that repetitions may be prevented both in this and in other places.

38. i. The Restoration of Nervous and Vital Power, when primarily depressed, is very often necessary; and the physician is called upon to accomplish this intention in a great variety of circumstances: in cases of mental and physical Shock (*see that article*); after the impression or action of numerous sedative, poisonous, or noxious causes; upon the invasion of any of the several infectious and pestilential maladies; in the cold stage of periodic fevers; and in the several forms of local or general Debility (§ 5, *et pluries*). In these, and even in other circumstances of disease, either the organic nervous energy, or the vital power generally is more or less depressed; but this may not be the only morbid condition. It may be associated with others in various grades, equally requiring attention and removal; but when it constitutes the prom-

inent or chief affection, the others may arise from and depend on it, and the vital depression then imperatively requires removal. When the depression is a primary effect of known, specific, or poisonous causes, the continuance of it may then be followed by one or other of three results: 1st. It may become more and more urgent, or may increase until the vital manifestations entirely cease; 2d. It may be followed by imperfect or abortive efforts at reaction, life at last sinking in the struggle; 3d. When the vital energies are not subdued in either of these modes, reaction of a tumultuous or excessive kind may supervene, and endanger the integrity of the structures or organs most predisposed to organic alteration. These results are the more likely to occur when specific, infectious, or poisonous causes occasion the primary vital depression; inasmuch as the functions of the secreting and excreting organs are then early impaired or interrupted, or entirely suppressed, and the blood and other circulating fluids are more or less altered, contaminated, or poisoned. In this, as well as in other states of disease, the Indications are, 1st. *To ascertain and to prevent the farther action of the causes occasioning vital depression;* 2d. *To remove the effects already produced;* and, 3d. *To prevent or counteract contingent or consecutive results.*

39. *A.* The *first* of these, although not always possible, may often be accomplished. A contaminating air may be corrected by ventilation, or by removing either the sources of contamination or the patient from their influence. But a specific infection or contagion, having once made its morbid impression, cannot be prevented from producing the succession of changes which characterize its effects, although these changes may be aggravated and vital power depressed by a humid, impure, or contaminated atmosphere; the second and third intentions are, therefore, to be attempted. Malaria, in any of its states, may have made its impression on the frame; and, although removed, the effects will take place in the form of vital depression, chills, rigours, &c., followed by vascular reaction, perspiration, &c. But if the patient were to remain during the progress of the disease subjected to the continued influence of this cause, the disease would be more severe, more difficult to remove, and more prone to occasion structural changes in predisposed organs, and might even assume a more continued and dangerous type. There are numerous external or physical agents which depress the organic nervous energy, and through this system lower the vital manifestations; and there are many mental, and intrinsic, and even structural conditions which produce similar effects, without being clearly evinced or ascertained. In these circumstances, although the causes, and the changes which they have induced, may be loosely inferred; yet their removal or prevention may not be within our power, and the next indication is to be at once attempted.

40. *B. Secondly.* To remove the depression already produced, is an intention which should be fulfilled by means, as respects their powers and natures, appropriate to the grade of depression and the phenomena characterizing it. But these means should have more or less reference, not only to the state of depression, but also to its causes—whether mental, physical, specific, infectious, &c. They ought to be sufficient for the end proposed; but not excessive in their operation, or such as are likely to occasion inordinate excitement or reaction, or irritation, or inflammation of the organs to which they are directed. In the more extreme cases, or when vital power is remarkably depressed by the invasion of infectious maladies, the more powerful stimulants are then required, aided by external measures, in order to determine the flow of blood to the external surface, and to relieve the internal organs from the congestion and vascular distention which oppress them, and which, without such means, the vital powers might not be sufficient to overcome. The invasion of several maladies produced either by malaria, or by infectious emanations, or by moral or physical shocks, is often attended by vital depression, characterized by a sense of sinking and of coldness; by tremours, rigours, or shiverings; by failure of the pulse, as respects either strength or frequency, or both; by a shrunk, cold, and bloodless state of the external surface; and by a feeling of oppression or of anxiety at the epigastrium and præcordium. These phenomena, when they are caused by malaria, are in most cases soon followed by vascular and vital reaction, unless in those circumstances and cases which are fully described in their proper places (*see* Fever, Intermittent, &c., § 33–35). In the more severe and congestive of such cases, retching or vomiting is generally added to the above characteristics of vital depression; and when the invasion of infectious and pestilential maladies, of exanthematous and other fevers, produced by their specific poisons, is attended by signs of vital depression, such as, or similar to, those now stated, there are generally also superadded retchings or vomitings, or both, evincing the more serious nature of the vital depression, and showing the efforts of Nature, not only to throw off the morbid cause, but also to resist the impression it has made, and to overcome the congestion produced by it in the large vessels and vital organs. In such dangerous circumstances, Nature points the way to the fulfilment of the indication under consideration, and therefore it should be followed by promoting it by appropriate means, such as by warm, stimulant, and demulcent draughts; by external warmth and warm baths, containing salt, mustard, &c., and by stimulating and aperient enemata, in order to remove fæcal accumulations and depressing morbid excretions. The great question is, In these circumstances how far should the vomitings be promoted or allowed to proceed? This can be decided only by the effects produced, and by the quantity and appearances of the matters ejected; but generally, if the retchings or vomitings continue beyond the time apparently sufficient for producing a salutary effect, if the matters thrown off be scanty, serous, or sero-mucous, and if the vomiting be attended by an internal sense of heat at the epigastrium, and tenderness or heat over the region of the stomach, and by other gastritic or gastro-enteric symptoms, then, instead of promoting the vomiting, or of exhibiting stimuli, &c., the gastric irritability should be allayed by refrigerant or cooling demulcents, conjoined with sedatives; by external derivatives, and other suitable means. (See *art.* Gastro-enteric Disease, and Stomach, Diseases of.) Nervous depression and sinking require for their removal the more diffusive stimuli, often conjoined with antispasmodics or with tonics, according to circumstances, and as shown in the article Debil-

ity (§ 43, *et seq.*). The same symptoms which indicate the propriety of restraining retchings and vomitings, should also forbid the exhibition, by the mouth, of stimulants or tonics, which in other circumstances of vital depression would be required, often liberally and frequently, but with due circumspection and regard to the effects produced, and to the peculiarities of the case; these medicines also being selected judiciously, and according to an enlightened experience.

41. *C. Thirdly.* During our efforts to remove primary vital depression by suitable agents, due regard ought to be paid to the prevention of contingent or consecutive results of an unpleasant or serious nature; and when these cannot be prevented, they should be counteracted as far as possible. The internal congestions, which frequently occur during the vital depression directly produced by sedative infections and poisonous causes, frequently continue after efforts at reaction have been made; or, although partially removed, give rise to more or less disorder, especially when secreting or excreting organs have been thus affected. Not infrequently the viscera which experienced congestion during the primary depression, become, during the consequent reaction, the seats of a congestive inflammation or irritation. Hence the propriety of preventing or anticipating these results in the treatment employed to remove the primary morbid condition—of prescribing those means which are least likely to convert congestion into inflammation, and which, while they remove the depression, restore the vital manifestations in the several secreting and excreting organs, and promote the functions of these organs, especially of the skin, kidneys, and bowels. The contingent evils upon vital depression depend very much upon the depressing causes; and where these causes are specific, the effects are generally such as may be expected, yet they cannot be entirely prevented, or even always allayed or controlled. If the causes are concentrated, the susceptibility great, and the consequent depression extreme, the contingent congestion and consequent effects, although expected, may soon destroy life, however judicious the means which may be used. Numerous proofs of this are furnished us by the histories of the more malignant cases of remittent, continued, exanthematous, and pestilential fevers. In these the causes characterize the effects, and all the manifestations of these effects throughout the frame; but, although these effects necessarily result, well-directed means may often allay or control them when they are excessive or dangerous. These means will necessarily depend upon the effects in the several forms of these maladies, and are such, as well as the particular effects they are employed to control, as can be discussed only under their specific heads, to which I must refer the reader.

42. ii. The Promotion of the several secreting and excreting Functions—of the depurating Processes, whenever they are torpid or impaired, has been just stated, as generally requisite to the prevention of many contingent evils, during states of vital depression by whatever cause produced; but it has a still more general application, for in all circumstances, and in all dynamic or other states of vital manifestation—in states of excitement and increased vascular action, as well as in those of depression—these functions are very often either torpid or impaired, or even interrupted, and require restoration; otherwise additional, or more severe and dangerous changes result, and the blood, loaded with excrementitial materials, occasions the most deleterious effects in vital organs. But the functions of depurating or excreting surfaces or organs are not confined to the mere elimination of injurious elements or materials. In connexion with this depuration, the organic nervous fibrils, by means of the capillary vessels, affect more or less the state of the blood circulating in the capillaries, and impart to it a more complete organization as well as vital properties. The blood, in different parts of the capillary circulation—in the skin, in the respiratory mucous surface, in the digestive villous surface, in the structures of the several glands—by the influence exerted on it by the organic or ganglial nerves, through the media of the capillaries, thus varies, in vital properties and in sensible qualities, with the modified vital manifestations of the ganglia and their nerves; the functions of organs or parts owing not only their differences and specific characters to these modifications, but also the amount of their performance.

43. Next to the sedative or depressing effects produced by the causes of disease, the impairment or arrest of depurating functions closely follows, the latter being very frequently the consequence of the former. These functions are often, in these circumstances, restored by the same means as are employed to remove the primary morbid impression, especially by a judicious selection of emetics, and of diffusive stimuli, and by warm, hot, or medicated baths. In all cases, 1st. *The Causes which impaired or interrupted these functions should be ascertained and removed;* 2dly. *The Means which the states of the several secreting and excreting functions require for their due promotion should be prescribed, and generally with marked reference to the causes on the one hand, and to associated and contingent pathological conditions on the other.*

44. *A.* Suppression of the depurating function of the *skin* illustrates the importance of these intentions, while it shows the several pathological effects which may result from it. The great diversity of these effects, upon different persons, depend upon, 1st. The existing susceptibility of the individual; 2d. The amount and duration of the cause; 3d. The predisposition of certain organs or tissues to be affected; 4th. The vicarious increase of other excreting functions, diminishing or modifying the effects produced by the cutaneous suppression; 5th. The concurrence of other causes with those which suppressed the action of the skin. The suppression of excreting function being referred to its cause with all possible precision, the exact nature and amount of the pathological effects should be ascertained. If the function of the skin be farther considered in connexion with this subject, we find that its suppression may be followed, especially if the kidneys do not perform a vicariously-increased function, by catarrh, or by rheumatism, or by inflammation of the lungs or pleura, or by diarrhœa, or by dysentery, or by enteritis, or by other maladies, according as the predisposition of parts may determine the morbid action. The cause or causes, whether exposure to cold or to influences depressing vital power, occasion, first, interruption of the depurating function of the skin, and, next, more or less fulness or congestion of, or

vascular determination to internal viscera or parts; and, in addition to this latter effect, and as a consequence of the suppression of the cutaneous function, the blood is loaded with these excrementitious elements which the healthy action of the skin eliminates. The conditions of the blood and of the circulation resulting from the changes and circumstances just enumerated, are such in many cases as kindle disease, either those now mentioned, or others of a slighter or severer nature. The practical importance of tracing the causes and the succession of effects is farther illustrated by the beneficial results which follow, when these causes are duly recognised, and the means of cure judiciously directed to the removal of the causes and the effects produced by them, and especially to the restoration of the impaired or suppressed function.

45. Still farther, the treatment of any of the diseases mentioned above (§ 43), when occasioned entirely or chiefly by suppressed cutaneous function, is legitimately based on the principle of restoring this function, and by its aid of removing injurious excrementitious elements from the blood, of soliciting the circulation to the external surface, and of diminishing the vascular determination to the seats of disease. The importance of attending to the depurating function of the skin is too frequently overlooked in the treatment of diseases, and in health, by all classes of the community. In the cases to which allusion has been here made, the means commonly resorted to, viz., warm and medicated baths and diaphoretics, suited to the nature of the disease and to the existing states of vital power and vascular action, are those usually indicated. But the appropriate use of these is to be acquired only by close observation and by an enlightened experience.

46. Not merely the restoration, but also the due preservation, of all the functions are most essential both to the removal of disease and to the continuance of health—more especially of the excreting functions; and those performed by the skin are not the lowest in the scale of importance. There are several practices connected with this function, in health and in disease, that have been too much neglected in modern times, although adopted among the ancients, and even by uncivilized communities at the present day; these are, anointing the surface of the body with oil; oleaginous frictions of the skin, especially after bathing; and the use of woollen or cotton coverings for several diseases, and while having recourse to diaphoretics. Frictions of the external surface with oil—with olive, palm, or other vegetable oils—promote the excreting functions of the skin, protect the surface from the injurious impression of physical, infectious, and morbid causes, and tend to preserve a due supply and distribution of blood to the extremities and external parts; and these effects are the more manifest the more constantly they are resorted to, in connexion with due ablution and bathing. The advantages also which result from lying in blankets or other woollen coverings, during the exhibition of diaphoretics, or when the depurating functions of the skin are being promoted, have been too generally overlooked in modern times, and deserve adoption in many diseases requiring an increase of these functions.

47. *B.* What has been said respecting the promotion of the *functions of the skin* applies likewise to the *other secreting and excreting functions*. Impairment or interruption of these, caused either by depressed vital manifestation, by lost or paralyzed power, or by mechanical obstruction, requires the same indications of cure as have been stated above (§ 39, *et seq.*), due regard being had, in the selection of our means, to the remote and the more immediate causes, and to existing and contingent pathological states. Of all the excreting or depurating functions, those performed by the *kidneys* are the most important, and most rapidly fatal when impaired, interrupted, or suppressed. But it is not merely impairment of this function as to the quantity of the excretion, but disorder of it as to the natural quality that also requires attention. Both conditions demand close observation, and furnish important indications for the treatment of disease, these indications being always derived from pathological states of most serious import, whether existing at the invasion, or in the progress, or towards the termination of disease. Mere deficiency of this excretion may require the use of means—of *diuretics*—suited to the vital conditions and to the states of vascular action; but the quality or chemical constitution of the urine, either independently of quantity, or in connexion with the abundance of the excretion, excites the most serious considerations, both as to the vital powers, and as to the states of the blood and circulation, and urgently requires powerful alterative or constitutional remedies, appropriate to existing pathological changes. Illustrations of the importance of recognising alterations not only in the quantity, but also in the constitution of the urinary excretion, and of founding rational intentions of cure on these alterations, are furnished in the articles on the BLOOD, on DISEASE, on DIABETES, on DROPSY, on the exanthematous and continued FEVERS, on diseases of the KIDNEYS, on the URINE, &c., to which I must refer the reader for the intentions and means of cure, when the functions of the kidneys are impaired, disordered, or interrupted, as to either the quantity or the quality of the excretion, and for the pathological causes and the consequences of such disorders of this excretion.

48. *C.* Impaired and interrupted excreting functions of the *intestines* and *liver* are next in importance to those of the kidneys. Many diseases originate in, or are characterized by, at an early stage of their progress, defective excreting action of the liver and bowels—in neglecting to promote these depurating functions. It is believed by many that the regular and daily evacuation of the bowels is quite sufficient; but this may not always be the case, as to either the fæcal discharge, or the biliary secretion, or even as to both; and, although the former may appear frequent and abundant, the latter may be deficient, or altogether wanting. Hence the importance of observing accurately the appearances of the intestinal excretions, both in health and in disease, and of having recourse to such means as those appearances, the frequency of evacuation, and the associated states of disease will suggest. The several substances arranged as *purgatives* and *cathartics* should be suited to the peculiarities of each case, and be conjoined with others of the same class, or with such as may either correct or promote their operation. The general effect of purgatives is to leave the bowels more or less torpid after their operation has ceased. This will

often be prevented by conjoining a bitter tonic with the purgative, as a preparation of gentian, or of cinchona, with that of senna, or the sulphate of quina with aloes, the digestive canal being thereby strengthened as well as excited to increased action. These and similar combinations are often slow in operating, but they generally procure full and feculent evacuations, whether given in these simple states of combination, or with various alkaline or saline and stomachic additions. The various topics connected with torpor or inaction of the bowels, and with similar conditions of the liver—with impaired excreting functions of the liver and intestines—are fully discussed under the heads Cæcum, Colic and Ileus, Colon, Constipation, Intestines, Jaundice, Liver, Rectum, &c., to which my limits oblige me to refer.

49. iii. To equalize the vital and vascular Actions throughout the Frame is a practical object, desired in all diseases in which vital manifestation or vascular action is inordinately expressed in, or determined to, any particular structure or organ; or in which vital organs are congested or oppressed. The entire accomplishment of the two preceding objects generally also attains this. Yet states of disease sometimes present themselves, or circumstances occur, which induce the physician to prefer such means as more directly act in this way—which equalize the vital and vascular actions. Indeed, most of those means act also upon the secretions and excretions, more especially on those of the skin, as when warm baths, warm diaphoretics, pediluvia, &c., are prescribed; and the very agents which are given to restore vital power (§ 37, *et seq.*) have often the effect of equalizing the circulation and promoting the secretions. The means just now mentioned generally produce these complex effects, and others are often equally efficacious when employed in suitable forms and appropriately to pathological conditions. The acetate and other preparations of ammonia, the spirits of nitric ether, sulphur, warm or imperfectly conducting bed-clothes, warm diluents containing diffusive stimuli, &c., have similar effects. In cases where local determination, or increased flow of blood, occasions either oppression, or augmented function, or causes defect of function in parts from which the vital or vascular action is derived, not only those means, but others of a more strictly *revulsive* or *derivative* kind, are often required, especially local depletions, dry-cupping, blisters, rubefacients, and other agents, whose operation is more permanent or continued, as setons, issues, and similar modes of producing *counter-irritation*, or even suppuration and vascular discharges. (See *arts.* Congestion, and Blood, *local plethora and determinations of*, § 23, *et seq.*)

50. iv. To moderate excessive Secretion and Excretion, or to restrain excessive Discharges, is an intention requiring much acumen in the physician to carry into safe execution. For the secretion or discharge may not be safely restrained or stopped. It may be a safety-valve opened by nature; and, when this is the case, it should not be closed without another having been substituted. When an attentive and a discriminating examination of the case shows that the discharge is productive of injurious effects, and requires either to be moderated or arrested; and when it is associated with other disorder, equally requiring to be removed, then such means as will have this effect, consistently with the nature of the secretion or discharge and with the existing state of vascular action, should be employed. Whenever an excessive or unnatural discharge is attended by increased vascular action, attempts to moderate, and far less to arrest it, should not be prematurely or hastily made, or, if made, they ought to be directed chiefly to the states of vital and vascular action. A nasal or hæmorrhoidal discharge of blood may prevent an attack of apoplexy or palsy, or of congestion of the liver or lungs. Any chronic or prolonged discharge, if abruptly arrested, may be followed by congestion or inflammation of the affected organ, or of an adjoining part, or by effusion into a shut cavity. Thus I have seen the sudden arrest of a copious leucorrhœa followed in different cases by congestion of the uterus, by inflammation of this organ, or by peritonitis, followed by copious effusion of serum. The same effects may also follow sudden arrest of a too abundant catamenial discharge. Whatever merely suppresses the morbid effect while the pathological cause or condition is allowed to exist, may be productive of bad or even fatal results. A chronic diarrhœa, if suddenly suppressed, without due attention having been paid to the appearances of the evacuations, to existing pathological states, and to the excretions from the skin and kidneys, or without either establishing a free derivation from the bowels, or determining the circulation to the surface, &c., may be followed by enteritis or peritonitis, with or without serous effusion into the peritoneal cavity. Epistaxis, if prematurely arrested, especially in persons of middle or advanced ages, or full habit of body, may be followed by an apoplectic, paralytic, or epileptic seizure.

51. In all cases of excessive or prolonged discharge, the nature of the discharge, and the changes from which it proceeds, require attentive examination; and these particulars having been ascertained, the treatment should be directed chiefly to the changes producing it. Many inordinate discharges, especially when acute or severe, or of sudden occurrence, cure themselves. As soon as the irritating secretion or accumulated excretions are fully evacuated, the disorder ceases, as in many cases of autumnal cholera or diarrhœa, and there remains only a slight irritation, occasioned by the morbid secretions, which either subsides, or is soon removed by promoting the functions of the skin, or by correcting morbid tendencies in the blood and digestive functions, or by other suitable means. Recourse is often had, in cases of excessive discharge, to the more powerful *astringents* or *tonics*, without due regard to the circumstances just mentioned, or to others of equal importance connected with the source of mischief; and in consequence of the use of these, the disease is arrested, and the patient thinks himself cured. But, after a short time, a different disease is manifested, one often more serious than its antecedent, and proceeds without the cause of its occurrence being sometimes suspected. Hæmorrhoidal discharges, or fistula in ano, especially when chronic, have been followed at some period, more or less remote from their cure by these or other means, by congestion of the liver or lungs, by hepatitis or pneumonia, or by ascites, or by increase of pre-existing pulmonary disease, as is most frequently the case.

52. v. To moderate or allay existing nerv-

OUS EXCITEMENT, OR UNNATURAL FUNCTION, OR IRREGULAR ACTION, is an intention which the physician is often called upon to accomplish, in the present state of society. The successful attainment of this end depends greatly upon a due recognition of the remote causes, both mental and physical,—both moral and corporeal,—and of pre-existing and existing changes. The removal of the causes should always be preliminary to attempts to allay the excitement, whether nervous or vascular. When the former is associated with the latter, it should always be ascertained whether the nervous disorder is occasioned by increased vascular determination and action, or whether this latter results from the former. The nature of the exciting causes will often render the procession of morbid phenomena more or less manifest, and at the same time suggest the indications and means of cure. When the causes are of a mental or moral nature, when they have acted chiefly on the susceptibility and sensibility of the individual, and when they have produced suffering, pain, spasm, or irregular muscular actions, then those means which are classed as *sedatives*, or *anodynes*, or as *anæsthetics*, are usually required; but in many of such cases, *stimulants*, or *antispasmodics*, or even *tonics*, may also be necessary in conjunction with these, particularly when debility or exhaustion is present. If, however, the nervous excitement be attended by increased vascular action, or local determination, and more especially if this excitement be a consequence of the vascular disorder, those means which will allay this latter disorder should precede a recourse to those which act chiefly on the nervous system. In such cases, the *antiphlogistic* and other measures usually required are often aided by a judicious recourse to sedatives or anodynes, or even to anæsthetics or narcotics, especially when want of sleep, or excessive pain, or restlessness, or disordered muscular actions, characterize the affection. If the nervous excitement or disordered actions be traced to vascular determination to, or inflammatory action in, any portion of the cerebro-spinal centres or their membranes, or to a similar affection of the sexual organs, or to other inflammatory or febrile conditions, then the same indications and means of cure as are noticed in the following section (§ 52, 53) are necessary; and when they have been judiciously employed, they may then be followed by such of the medicines belonging to the above classes as are most appropriate to the existing states of nervous disorder.

53. vi. TO ALLAY OR MODERATE INCREASED VASCULAR ACTION, OR TO REMOVE VASCULAR DISORDER, is obviously required, especially when excessive; for we cannot with propriety leave this disorder to the unaided efforts of nature, unless it be slight, and the constitution and age of the patient be such as warrant confidence in the result. In order to allay increased vascular or febrile action, the physician should investigate its causes, its manifestations, the states of the secretions and excretions, the indications of vital power, and the conditions of the circulating fluids, as far as they are indicated by the pulse and by the hue of the surface, of the lips and tongue, and of the extremities. The diathesis of the malady—sthenic or asthenic, dynamic or adynamic—and other changes having been inferred from these sources, the *indications* and means of cure must be based upon them. If the vascular or febrile excitement be *sthenic*—if it be characterized by a salutary reaction indicating neither impairment of organic nervous or vital power, nor contamination of the fluids—it should be allayed by the means classed as *antiphlogistic* and *febrifuge*, comprising blood-letting when the nature of the case requires it, in any form. In addition to these, substances which promote the secretions and excretions, which equalize the circulation when it is inordinately determined to particular organs, and which derive it from the affected organ to the external surface, are generally beneficial.

54. When the vascular or febrile excitement is *asthenic*—when vital power is exhausted or depressed, and the circulating fluids are contaminated or poisoned by infectious or injurious elements, or materials which irritate or excite the vascular system—then the *indications* of cure are: 1st. To support the vital energies; 2d. To promote the secreting and depurating functions; 3d. To correct or counteract the morbid states of the blood, by such medicines as may be absorbed into the circulation and produce these effects. The importance of this last indication is so great as to require for itself a distinct consideration (§ 54–56). Sufficient illustrations of this therapeutical principle are to be found in the articles ERYSIPELAS, FEVERS, INFLAMMATIONS, and PESTILENCES, as well as under other heads, where a more special consideration is devoted to the several topics embraced by it.

55. vii. MORBID STATES OF THE BLOOD ARE TO BE CORRECTED OR COUNTERACTED BY MEANS WHICH OBSERVATION, SCIENCE, AND EXPERIENCE HAVE SHOWN TO BE SUITABLE TO THIS END.—Morbid conditions of the blood are so various as respects their causes, associations, and consequences, and are so little known, especially as regards their intimate natures and the slighter and subtiler alterations, as frequently to render the *intentions* of cure imperfect, their accomplishment unsatisfactory, and the choice and operation of means doubtful. We know that the blood and the secretions and excretions are more or less contaminated in many maladies, and owing to many causes, 1st. That the contamination may take place slowly and insidiously, until, upon the action of some exciting or concurring cause, active disease is developed in the form of gout or rheumatism, or of scurvy, or of cutaneous affections; 2d. That it may result more rapidly and much more dangerously, owing to the absorption of morbid secretions or injurious materials into the blood, as in cases of purulent or sanious infection; and, 3d. That it may take place in a more rapid and specific manner, from a poisonous infection, producing its peculiar seminium, and propagating itself among all who are susceptible of its operation, even although in many cases the changes of the blood are neither considerable nor manifest. Morbid states of the blood are often the most evident and productive of the most dangerous results in the advanced stages of continued, remittent, exanthematous, and pestilential fevers; and these states, whether proceeding from foul, contaminating emanations, or other causes, or from a seminium of a specific nature, generating its like, affect both the secreted fluids and the solids, as shown when treating of the maladies produced by these causes. In the earlier stages and slighter cases of these diseases the changes of the blood are either very slight or not very

manifest; yet they nevertheless may be inferred to exist, inasmuch as the odour of the blood has been found different, and the same species of disease has been propagated by it.

56. Alterations of the blood are owing, as shown above and more fully in the articles BLOOD and DISEASE, and in those on the maladies in which these alterations are the greatest, to pre-existing morbid states, as in *scurvy*, *purpura*, *gout*, *rheumatism*, &c., or to the poisonous operation of infectious miasms emanating from a person similarly affected, as in the *pestilences*, the *exanthemata* and *malignant fevers*. We know that diseases which are most malignant and dangerous proceed from causes which remarkably depress the powers of life, and either suppress or disorder the depurating functions. Hence it may be inferred that, although the specific cause produces effects which are constant and specific, the resulting changes on the blood, especially when heightened by vital depression and impaired excretion, increase the malignancy of the malady, and often either occasion or hasten death. Now, to counteract these changes it becomes necessary, 1st. To support, promote, or restore vital power, as far as may be possible; 2d. To promote or restore the several excreting or depurating functions; and, 3d. To endeavour to correct or neutralize the morbid materials or elements formed or accumulated in the blood in the progress of, or antecedent to the full development of the malady. The *first* and the *second* of these intentions should be energetically carried out by the same or similar means to those adverted to above (§ 37–47)—by powerful *restoratives*, *tonics*, *stimulants*, &c.; and by stomachic, warm, and stimulating *emetics*, *diaphoretics*, *diuretics*, and *purgatives*, as may be most appropriate to the nature and state of the malady.

57. The *third indication* is that which more especially concerns the present subject. In certain diseases, in which the blood is very manifestly altered, the crasis or coagulating power of this fluid is increased, as in rheumatism and gout; while in others it is more or less impaired, as in scurvy, and in the malignant maladies alluded to above. In the former, *alteratives*, as the alkalies and the alkaline earths, especially magnesia, are required to neutralize the acids formed in the digestive canal, and even also in the blood; in the latter, the most powerful *stimulants*, *tonics*, and *antiseptics*, are necessary to the restoration of vital power, of the irritability of the contractile fibre, and of the crasis of the blood, and to the counteraction of the tendency to dissolution manifested by both fluids and solids—to the putridity contended for by the older writers. Of the several tonics and stimulants often required to fulfil the present indication, it is unnecessary to make mention at this place, as their use is fully shown under the diseases in which they are most appropriate. Of those which manifestly prevent or counteract a septic tendency, it may be remarked that, whatever supports or restores vital tone, has indirectly this tendency, but that there are substances which possess this property in a more direct manner—that are more strictly *antiseptic*—as hydrochloric acid, the chlorides and hydrochlorides, chlorinated waters or fluids, the chlorate of potash, the nitrate of potash, and several other alkaline salts, the terebinthinates, balsams and camphor, creasote and tar, the cinchona and cascarilla barks, and the barks of several trees, as the oak bark, willow bark, cedar bark, &c. In the more urgent or malignant cases, two or several of these may be conjoined or given with stimulants or tonics, as the decoctions or infusions of cinchona, or of serpentaria, or of arnica, with nitrate of potash, the carbonates of the alkalies, or the chlorate of potash, &c.

58. viii. TO ALLAY MORBID IRRITATION BY MEANS SUITED TO THE SEVERAL MANIFESTATIONS OF THIS CONDITION is often of urgent importance, and always is attended by great difficulty, inasmuch as the successful accomplishment of this object requires an accurate interpretation of the cause and essence of the morbid conditions or changes on which the irritation depends. The source of irritation may exist *locally* in any structure or tissue, or in a nervous ramification; or generally, in the blood and in the secreted and excreted fluids; or both *locally* and *generally*. When it is *local*, it may, according as it may affect the nerves or the blood-vessels at its source, either occasion spasm, convulsion, or severe or neuralgic pain, or produce alterations of structure, acute or chronic inflammation, and their several consequences. When it is *general*, febrile action, more or less violent or acute—more or less rapid in its course, and dangerous in its issue—is always present; the morbid, contaminating, or poisonous materials present in the blood and other fluids inordinately exciting vascular action, and at the same time depressing nervous or vital power. When the irritation commences locally and becomes general, then the secretions and nutrition of the part have been changed, and the morbid products have been absorbed into the circulation; and while the local irritation continues, the general irritation is superadded, occasioning an amount of febrile or general disturbance, varying with the nature and the amount of the materials absorbed, with the state of predisposition or diathesis, with the accumulation of these morbid matters in the blood, or with the rapidity of their elimination by the emunctories. Thus we have presented to our observation sources of local irritation and change, followed more or less rapidly by every grade of hectic or irritative fever; and not merely by these, but also by destructive changes consecutively produced in various organs, and more especially in those concerned in the elimination of the morbid matters from the blood. It is unnecessary to prosecute this subject any farther, as it is fully considered in the articles ABSCESS, ABSORPTION, HECTIC FEVER, and more fully and in its several relations, both pathologically and therapeutically in the article IRRITATION.

59. ix. TO ALTER, OR MORE COMPLETELY TO CHANGE MORBID STATES OF INDIVIDUAL TISSUES, OR OF THE STRUCTURES GENERALLY, may be considered an intention, the fulfilment of which is beyond our powers. I have shown, when treating of typhoid, adynamic, putro-adynamic, and malignant *fevers*, and *exanthematous* and *pestilential maladies*, and of *scurvy*, *syphilis*, &c., that we have every proof of alterations having taken place, in the advanced course of these diseases, not only in the fluids, but also in the vital cohesion and intimate organization of the more solid structures, and yet the vital powers may arrest these alterations, and gradually restore the healthy conditions. This great end can be attained only by the restorative efforts of nature—by the development of vital resistance to farther changes.

The constitutional powers often, by resisting farther alterations, accomplish this object without assistance, or merely by the aid of freer ventilation, of a purer air, or by the removal of injurious influences. But these powers are often assisted or developed by art—by means which restore or promote nervous or vital energy (◊ 37, *et seq.*), and which moderate, correct, or remove morbid states of vascular action and alterations of the blood (52–56). The indications, as well as the means, are fully discussed in the treatment of the maladies just referred to, and of several chronic and cachectic diseases, especially *scrofula, rickets, scurvy, venereal diseases*, &c., to which I must refer the reader.

60. x. TO PREVENT OR REMOVE EXHAUSTION IN ITS VARIOUS FORMS is often required of the physician; but the nature of the previous excitement of which exhaustion is the consequence, should be ascertained, as the issue in many cases depends upon such excitement and its causes—whether mental or physical, moral or corporeal. The *indications* and the *agents* required to fulfil them are usually the same as have been already mentioned when treating of primary depression of nervous or vital power (◊ 37). In this latter state of vital depression, although its cause may be more energetic and dangerous, yet the frame is more generally free from structural change of its tissues or organs, and reaction is more readily produced, than in the secondary vital depression, or exhaustion consequent upon mental, nervous, or vascular excitement. Whereas in the exhaustion thus produced, and more especially when following vascular disorder, alterations of the fluids, and even of the structures, are more likely to be present, and to complicate the vital depression, the structural change and the vital condition mutually increasing each other, often opposing the influence of the most judicious means of cure, and generally requiring the most energetic and the best-directed agents for their removal. The observations which I have offered on this subject when treating of *consecutive and complicated* DEBILITY (see *art.* DEBILITY, ◊ 43, *et seq.*) will farther elucidate this subject.

61. xi. TO REMOVE CONGESTIONS OF BLOOD, ACCORDING TO THEIR SEATS, is one of the most important ends for which medical aid is required. To accomplish this end the most energetic agents are often necessary, especially when congestion is complicated with marked depression of organic nervous or vital power, or with oppression or suppression of the functions of the congested organ. In these circumstances the indications are, 1st. To *derive* the circulation from the seat of congestion to other external parts, by suitable *revulsants, rubefacients*, &c.; 2d. To equalize the distribution of blood throughout the frame, as advised above (◊ 48); 3d. To support nervous or vital power, especially when inordinately depressed, by appropriate restoratives and stimulants; and, 4th. To restore the function of the congested organ. This subject is fully elucidated in the articles CONGESTION and BLOOD (◊ 23–33).

62. xii. TO ENABLE ORGANIC NERVOUS OR VITAL POWER TO RESIST THE SLOW EXTENSION OF DISEASE, OR TO OVERCOME ITS MORE RAPID ADVANCES, AND TO THROW OFF PARASITICAL AND OTHER FORMATIONS, are ends which should be much more frequently proposed for successful attainment in practice, than they usually are. In many diseases, the efforts of nature are insufficient for these purposes, unless they be aided by suitable means. In malignant and pestilential maladies, these efforts are inadequate in the most severe cases, and should be reinforced by the most energetic means, especially by tonics, stimulants, antiseptics, and others already noticed. In diseases of a slower course, as scrofula, scurvy, and morbid formations of various kinds, tonics, conjoined with alteratives, are generally indicated; but very much depends upon the choice which is made of these means, which should be appropriate to the nature of individual cases. In most of the diseases which require the development of vital resistance, restorative agents ought to be directed both to the organic nervous system and to the blood—the energy of the former must be excited, and the crasis and purity of the latter must be preserved, or restored when deficient. In acute malignant maladies, the means which we possess are not always equal to the attainment of these ends. The vital energy may be too far depressed to be excited by medical agents, however well selected or directed; or, if it be excited, the reaction evinces features equally morbid and dangerous with those of the previous depression; for the states of the fluids, especially of the blood, conduce to structural changes as rapidly and certainly during vascular reaction as during vital depression. Hence it is generally insufficient merely to rouse the organic nervous, or vital power, unless we also procure a free elimination of morbid materials or elements from the blood by the emunctories, and, at the same time, prevent or correct alterations of this fluid by means appropriate to the inferred alteration, as advised above (◊ 54–56).

63. In chronic, malignant, or structural maladies, the constitutional or vital power is impaired, and the blood is altered more or less, although not always visibly or demonstratively altered. As these maladies advance, especially cancer, tubercle, rickets, &c., the alteration of the blood becomes more and more evident, this fluid being thinner, poorer, or deficient in red globules. Hence the necessity of supporting the powers of life by means which will neither excite nor irritate them, and of preserving the healthy state of the blood by conjoining with those means such as will correct or prevent alterations of this fluid, and will, at the same time, promote the conversion of the colourless or chylous globules of the blood into red globules—will promote the processes of sanguification and nutrition—as chalybeates and cod-liver oil.

64. The same indications and means which are most successful in resisting the slow extension of organic or malignant maladies are also most advantageously employed in throwing off *parasitical animals* and *productions*, and in preventing their generation or formation. Although the expulsion of parasitical animals from the digestive canal requires a recourse to a class of remedies which act chiefly either on the canal itself, or on the *entozoa*, or on both, and are usually classed as *anthelmintics*; yet the reproduction of these animals is to be prevented only by means which develop organic nervous power, which improve the states of the blood, and of the secretions and excretions, which promote the digestive functions, and which insure a healthy nutrition. Of these means nutritious food, and pure air and pure water, are among the most important.

65. xiii. TO RESTORE, AS FAR AS MAY BE RE-

STORED, IMPAIRED OR LOST FUNCTION is to remove a very large proportion of the ailments to which our frames are liable. This being a great end of medical treatment, the course which may be pursued in attaining it should be duly considered, and with a strict reference in practice to the nature of individual cases. The means used for attaining this object should be directed either, 1st, to the sources of function; 2d, or to the organ itself, whose function is impaired or lost; 3d, or to the promotion of the general health and constitutional powers; and, 4th, or even to these conjointly, coetaneously, or consecutively. The great importance of attaining this object has been insisted upon when noticing the consequences of impairment of the excreting or depurating functions (§ 41, *et seq.*); but there are other functions than those of elimination which may be impaired, and the issue may be more or less serious. Most of the disorders comprised under the *first class*, in the arrangement which I have followed in this work, consist of impaired function or defective action; and in all these the indications now stated may be severally adopted.

66. The means of cure, when not acting directly on the surface or organ to which they are applied, and frequently even when directly affecting such surface or organ, act also, 1st, on the nervous systems, especially the organic; 2d, on the vascular system and on the blood, and, through either or both these channels, indirectly or consecutively on the organs or surfaces whose functions are defective. The deficient function may thus be restored by stimulating the nervous endowment of its appropriate organ at or near the origins of the nerves, or by exhibiting medicines which are imbibed or absorbed into the circulation, and either alter the constitution of the blood or excite the organ or surface whose functions are impaired by their presence in this fluid. The actions of the kidneys, for instance, may be increased by stimulating applications over the loins, or by various substances (*diuretics*), which, having passed into the circulation, and being carried by the blood to these organs, excite them to increased action, either while these substances are being eliminated by them, or while circulating through them before they are eliminated by some other emunctory. The secreting and excreting functions of the liver, of the digestive mucous surface, of the bronchial mucous surface, of the skin, &c., are augmented in similar ways by the several classes of medicines, which, owing to these respective predominant modes of action, according to their doses and combinations, have been called *chologogues*, *aperients* or *purgatives*, *expectorants*, *diaphoretics*, &c.

67. XIV. TO PALLIATE URGENT OR DISTRESSING SYMPTOMS, EITHER WHEN THEY CANNOT BE REMOVED, OR IN ORDER TO OBTAIN TIME TO ASCERTAIN THEIR SOURCES AND FOR THE REMOVAL OF THESE SOURCES, OR PATHOLOGICAL CAUSES, is an intention which the physician may propose to himself either at the outset or invasion of disease, or at its ultimate or fatal close, even in cases of little or no danger, and in those of the greatest danger. It is obvious that the means, in these very different circumstances, should have strict reference to the nature and tendency of the phenomenon or symptom by which the patient is distressed. If it be alarming sinking, stimulants and restoratives are required; if violent or painful spasm, antispasmodics, anodynes, sedatives, &c., according to the seat, antecedents and concomitants of the *spasm*; if it be extreme pain, sedatives, narcotics, and other means advised under the head of *neuralgic affections*; if to remove alarm or mental perturbation, the combination of restoratives or stimulants with sedatives or narcotics; making always such selection of means as experience, derived from enlightened and close observation, will suggest and will point out as appropriate to the features and complications of particular cases. A judicious application and combination of means, in the most extreme cases, and when no hopes of prolonging life can be entertained, will, in conjunction with the solace of religion, render dissolution as calm and peaceful as the accession of the natural sleep.

68. XV. TO EXCITE AND DIRECT THE MENTAL EMOTIONS, SO AS TO PREVENT THE EXTENSION OR AGGRAVATION OF DISEASE AND TO INSURE OR HASTEN RECOVERY, is one of the highest aims of medical science, and is often conducive both to the prevention and to the removal of disease. *Fear*, *anxiety*, and all the *depressing emotions* not only predispose the frame to the invasion of disease, but also impart to disease an asthenic or low character, and conduce to unfavourable results; whereas, *confidence*, *hope*, and all the elevating emotions support the powers of life, reinforce the vital resistance, and impart a great share of the efficacy exerted by the means of cure. Not only ought all mental and moral circumstances which either have caused or have influenced the progress of disease, to be removed as far as possible, but the mind of the patient should be inspired with hopeful sentiments, and by the confident bearing and expression of the physician. There are numerous circumstances, also, directly affecting the mind, and indirectly influencing it through the media of the senses, which aid the treatment of disease, especially of diseases which are chronic, or which impair the mental energies. The chief of these are, agreeable mental occupations; the solaces resulting from the performance of duties and from conferring benefits on the deserving; the contemplation of the numerous wonders and beauties of nature; the enjoyment of musical and harmonious sounds, of the appeals of reason and eloquence, and of instructive and interesting society; the affectionate regards of relations and friends, and rational amusements and relaxation. In addition to these, changes of scene, of air and locality, or more complete change of climate, and travelling, with all the circumstances which render travelling mentally and bodily healthful, should not be overlooked.

69. Having thus endeavoured to point out, for the *instruction* of the inexperienced, and as *suggestions* to others who wish to review the stores of information with which observation may have enriched their minds, what I consider to be, 1st. *The fundamental principles of medical practice or Therapeutics*; 2d. *The more general principles*; and, 3d. *The special principles of Therapeutics*, I shall conclude with an ARRANGEMENT *of the modes of employing*, and *of the operation of medicines*. When treating of POISONS, I gave a full exposition of the modes of exhibiting, the channels of operation, and the physiological and pathological effects of poisons. It is obvious that, as many poisons are employed, although in very different states and doses, as very important means of cure, the *classification* of these will necessarily approach to that of *Therapeutic Agents*; and

hence several resemblances will be observed between the arrangement given in that article and the classification which I am now about to submit to my readers.

Therapeutical Agents, Classification of, according to their Modes of Action and Effects.

The *classification* of medical agents is a matter of great difficulty, and hence numerous excellent attempts have been made to overcome the difficulty by many of the more recent writers on Therapeutics. My limits will not admit of my noticing these in the manner which they deserve; but the reader who is desirous of becoming acquainted with them, will find them in the works of their respective authors enumerated in the Bibliography. The arrangement I am now about to adopt may not be superior to several of those which have been already published; but, as it is in accordance with the views exhibited in this work, more especially in this article and in that on Poisons, I have adduced it at this place.

I. Psychical or Mental Remedial Influences.
- i. Those furnished through the Media of the Senses.—*The sensual affections of mind—External affections of mind.*
  - *A.* Affections of mind induced by *pleasant odours* and *tastes*.
  - *B.* States of mind induced by *Vision*—by the sight of the beautiful in nature and art, of endeared objects, especially after absence or dangers, &c.
  - *C. Sounds* and *Noises*, of various kinds, especially such as are monotonous, often favour the occurrence of sleep. Appeals of reason and eloquence. Musical and harmonious sounds, vocal and instrumental, in due variety or combination. The society of relations and friends. Rational amusements, &c.
  - *D.* The Sense of *Touch*.—Frictions—Rubbing—Shampooing—Flagellation, &c.
- ii. The Intellectual Affections of Mind.
  - *A.* A due and moderate exercise of the powers of *perception—conception—memory*—or *powers of consciousness*.
  - *B.* A well-directed exertion of *imagination*—of *reason* and *judgment*—and of *other active intellectual states*.
  - *C.* A due exercise of the *powers* of *reflection*—of *right* and *wrong*—of *causation* and *truth*—of *duty—immortality*, &c.—of *rational incentives to duty*.
- iii. The Moral Affections of Mind.
  - *A. Instinctive or simple moral Affections.*—Hope—Confidence—Anticipation of pleasures and happiness—Love—Desire of approbation, of knowledge, of power, &c.
  - *B. Rational Emotions of Mind.*—The duties which the individual owes himself and those connected with him—Religious obligations—Agreeable mental pursuits—Useful occupations—Rational amusements, &c.

II. Hygienic Agents and Influences.
- i. Food and Drink.
  - *A. Food.*—*a.* Vegetable and farinaceous aliments.—*b.* Animal food.—*c.* Mixed food.—*d.* Regulated diet or dietetic regimen during and after disease.
  - *B. Drinks.*—*a.* Distilled and spring waters.—*b.* Mineral waters.—*c.* Beverages, wines and liquors.—*d.* Prescribed forms or combinations of these.
  - *C. Condiments.*—Spices, Sauces, &c.
- ii. Air and Locality.
  - *A. Purity of Air*, in connexion with locality with the soil and with its productions.
  - *B. Light and Sunshine.*
    - *a.* Influence of light.
    - *b.* Effect of the sun's rays—the chemical—the electrical or magnetic—the colouring, &c.
    - *c.* Of the absence of either or all these.
  - *C. The temperature, dryness, or humidity of the Air.*—Dependence of these on latitude, on altitude, on the soil, on the productions of the soil, on position or locality.
- iii. Of Exercise.
  - *A. In-door Exercise.*—*a.* Occupations and employments.
  - *B. Exercise in the open Air.*—*a.* Walking.—*b.* Riding.—*c.* Active and athletic exercises.
- iv. Climate and Change of Climate (see *art.* Climate).
  - *A. Climate of Great Britain and Ireland.*
  - *B. Foreign Climate.*—*a.* European.—*b.* Asiatic.—*c.* African.—*d.* American.—*e.* Australasian and Polynesian.
  - *C. Changes of Climates.*
    - *a.* Effects of change on different races or colours.
    - *b.* Effects of change on disease.
  - *D. Travelling and Voyaging.*
    - *a.* Travelling by railroads or otherwise.
    - *b.* In sailing or in steam vessels.
    - *c.* The several effects of these modes.

III. Medicinal Agents—Medicines applied to the Frame.
- i. Modes in which Medicines are employed or exhibited.
  - *A. To the respiratory Organs.*—Inhaled or inspired.
  - *B. Taken into the Stomach.*—In various forms and combinations, without or with the food.
  - *C. Injected or introduced into the Bowels.*—Enemata and suppositories.
  - *D. Introduced or injected into the sexual and urinary Organs.*
    - *a.* Into the vagina.
    - *b.* Into the urethra and urinary bladder, &c.
  - *E. Applied externally.*
    - *a.* To the general surface, or part of the surface.
    - *b.* To a part of the surface after the removal of the cuticle.—Endermic medication.
  - *F. Injected into the Blood-vessels.*
- ii. The Action of Medicines.
  - *A. Locally and Primarily.*—On the tissues to which they are applied.
  - *B. Remotely and Consecutively.*—Sympathetically, and by the blood.
  - *C. Both Locally and Remotely.*
  - *D. Chemically.*—By altering the chemical constitution of fluids and solids.
  - *E. Mechanically and Surgically.*
  - *F. Vitally.*—By altering the states of function or vital manifestation.
  - *G. Organically.*—By affecting the structure or the intimate organization of parts.
- iii. The Modes in which, and the Channels through which Medicines act.
  - *A. Primarily and Locally.*
    - *a.* On the nerves of the part.
    - *b.* On the capillaries of the part, and on the contained fluids.
    - *c.* On the irritability of the tissues.

d. On the organization and structures of the part.

B. Sympathetically or through the media of the organic and the animal systems of nerves.

C. By imbibition, or endesmose and absorption. —Through the medium of the circulating fluids, especially the blood.

iv. The General Effects of Medicines.

A. Depressing nervous influence and vascular action. — Lowering vital power—Sedatives or depressants.

B. Stimulating nervous influence, either organic or animal.—Stimulants.

C. Exciting vascular action.—Phlogistics.

D. Exciting both nervous influence and vascular action.—Excitants.

E. Exhausting nervous influence or vital energy.—Exhaurients.

F. Altering, otherwise than dynamically, nervous influence and vital power.—Alterants.

G. Changing the sensible appearances and the constitution of the blood.—Hæmapharmaca. —Blood-remedies.

H. Producing a succession of two or more of these effects.

Classification of Medicines according to their Special Operation.—The Physiological Action of Medicines.—*Remedial Agents according to their special effects.*

Class I. Abstracting the Animal Heat, or depressing the Calorific Process in a part or throughout the Body.—Refrigerants.

i. *External Refrigerants.*—Thin Clothing—Cool or cold Air—Cold Baths—Cold affusions or Douche — Cold sponging — Shower-baths — Cold or evaporating Lotions—Ice applied externally—Cold Solutions.

ii. *Internal Refrigerants.*

a. Dietetic Refrigerants.—Lemons, Oranges, Mulberries, Strawberries, Pomegranates, confected Ices, Tamarinds, common Sorrel, Lettuce, Whey, Buttermilk, &c.

b. Medicinal Refrigerants.—Cold fluids—Ice and iced waters—Solutions of Hydrochlorate of Ammonia—of Nitrate of Potash—of Nitrate of Soda—of most of the alkaline neutral salts—Citric Acid and the citrates—Tartaric Acid and the tartrates — Acetic Acid — Acetate of Ammonia, &c.

Class II. Depressing, suppressing, or benumbing Sensibility, or paralyzing Involuntary and Voluntary Motions.—Sedatives.

i. *Mental Sedatives.*—Grief, Anxiety, Fear, Terror, Regret, Sadness, Disappointment, Loss of fortune, reputation, friends, &c., Home-sickness, &c.

ii. *Physical or Medicinal Sedatives.* — Humid states of the atmosphere, and whatever favours the transfer or eduction of electricity from the frame. The preceding agents (Class I.) when long or largely employed, relatively to the state of vital power or resistance, the preparations of Lead and Saturnine Solutions, Hydrocyanic Acid, Laurel water, volatile oil of Bitter Almonds, Cyanide of Potassium; Tobacco and its several preparations, especially the oil; the infusion, decoction, and smoke of Tobacco, Nicotina, Sulphuretted Hydrogen gas, Carburetted Hydrogen gas, Carbonic Acid gas, Chloroform and Ethers, especially when inhaled; excessive blood-letting, or vascular depletion causing syncope.

Class III. Softening, liquefying, or dissolving one or more of the Tissues or Textures.—Dissolvants.

The Alkalies and alkaline sub-carbonates—Antimonial Salts—The Oxalates and Oxalic Acid—Boracic Acid—Biborate of Soda—Putrid animal matters, &c.

Class IV. Astringing the tissues, and increasing the Tone or Vital Cohesion of Structures — Astringents and Tonics. — Antiseptics.

i. *Vegetable Astringents.*—Oak bark, Nutgalls, Catechu, Kino, Uva-Ursi, Rhatany—Tormentilla, Pomegranate bark or rind, Logwood, Bistort, Matico.

ii. *Bitter Tonics.* — Quassia, Simarouba, Gentian, Calumba, Cheirayta, Common Centaury, [Gold Thread,] Buckbean, &c.

iii. *Astringent and Bitter Tonics.*—The Cinchona barks, Spigelia*—Elm bark, Willow bark.

iv. *Aromatic Tonics.* — Cascarilla bark, Wormwood, Elecampane, Canella bark, Angustura bark, Hops, Cedar bark, [Chamomile.]

v. *Acid Tonics.*—*a. Mineral Acids:* Sulphuric, Nitric, and Hydrochloric Acids; Alum. — *b. Vegetable Acids:* Formic Acid, Gallic Acid, Catechuic Acid.

vi. *Alkaloid Tonics.*—Quina, Cinchonia, Salicine, Quassine, [Strychnia.]

vii. *Metallic Tonics.*—The salts, oxides, and carbonates of Iron, of Silver, Zinc, [Copper, Bismuth, Arsenic, &c.] The bichloride of Mercury in minute doses.

Class V. Irritating Tissues, Structures, and Organs.—Irritants.—Corrodants.

i. *The mineral salts,* in large doses or in quantities above those producing a tonic or astringent action. The chlorides and chlorates of the alkalies. The metallic salts, as the sulphates and chlorides of Zinc, Copper, &c. The Nitrate of Silver, salts of Antimony, &c. Lime unslacked.

ii. Euphorbia, Croton Tiglium, Savine, Rhus Toxicodendron, Mezereon, Pyrethrum, and numerous acrid or irritant *vegetable productions* and vegetable oils. (See *art. Poisons,* § 234–248.)

iii. *Animal Irritants,* as Phosphorus, Cantharides, and the scales of many insects—Morbid Animal secretions and poisons.

iv. *Physical and Mechanical Irritants.* — Urtication, Heated Air, Hot Water, Heated Metal. The Actual Cautery, Setons, Issues, &c.

Class VI. Relaxing the Tissues, or lowering the Irritability of Structures.—Emollients—Demulcents.

i. *Aqueous Emollients.*—Water at ranges of temperature between 65° and 170°—Aqueous Vapour, Medicated Aqueous Vapours.

ii. *Mucilaginous Emollients — Demulcents.* — Prepared from Gum Arabic, Tragacanth, Mallows, Marsh-mallows, Colt's-foot, Linseed, Sweet Almonds, &c.

iii. *Amylaceous Emollients.* — Farinaceous and starchy substances — Flour, Oatmeal, Barley, Sago, Arrow-root, Starch, Tapioca, &c.

iv. *Saccharine Emollients.*—Honey, Liquorice, Sugar of Milk, Beet-root.

v. *Albuminous Emollients.*—White and yolk of Eggs, Milk, Saliva.

vi. *Gelatinous Emollients.*—Gelatin in its pure

* [Spigelia can hardly be ranked among tonics.—Ed.]

or other forms, or as obtained from Isinglass, Hartshorn shavings, Tendons, Bones.

vii. *Oleaginous Emollients.*—Animal fats, Butter, Spermaceti, Vegetable oils, especially Palm, Olive, Almond, Linseed, and other oils.

Class VII. Stimulating, or exciting the Vital Manifestation of a Tissue or Organ.—Stimulants—Excitants.

Stimulants are related, on the one hand, with *Tonics* and *Irritants*, especially when the latter are given in small doses; and with *Sudorifics*, *Evacuants*, and *Diuretics*, on the other. They act primarily on the organic nervous, and on the Cerebro-spinal nervous Systems, according to the manner of using them.

i. *Condimental and Aromatic Stimulants.*—Garlic, Leeks, Onions, Mustard, Horseradish, Scurvy-grass, Water-cresses, and other anti-scorbutic plants. The hot or warm spices—Ginger, Pepper, Capsicum, Cloves, Cinnamon, Canella, Ginseng, &c.

ii. *Resinous and Balsamic Stimulants.*—Guaiacum, Mastic, Elemi, the Turpentines, Copaiva, Opobalsum, Benzoin, Styrax, Tolu, Peruvian Balsam.

iii. *Gum Resins.* — Asafœtida, Ammoniacum, Galbanum, Sagapenum, Opoponax, Myrrh, Olibanum.

iv. *Camphoraceous Stimulants.*—Camphor, Arnica, Serpentaria, Contrajerva, Valerian, Cajuputi Oil.

v. *Ammoniacal and other Stimulants.*—The preparations and salts of Ammonia. The empyreumatic oils, Phosphorus, Musk, Sumbul, Castor.

vi. *Alcoholic Stimulants.*—The several alcoholic liquors. Wine, Alcohol, the Ethers. Malt and fermented liquors.

vii. *Calorific and Electrical Stimulants.*—A temperature exceeding 60°. The sun's rays, especially as imparting light, heat, and electrical influence. Dry heat above 60° and not exceeding 120°. The electro-motive or the electro-magnetic current.

Class VIII. Augmenting the Secretions and Excretions.—Evacuants—Depurants.

Substances which produce this effect, generally first excite the organic nerves, supplying the parts on which they act, and consecutively attain the end which chiefly characterizes them. In larger doses, they not only stimulate the functions to which they are directed, but often also *irritate* more or less remarkably the tissues to which they are applied. They are thus closely related to *Stimulants*, and to *Irritants* and *Alterants*.

i. *Increasing the Secretions from the Schneiderian membrane.—Errhines.*
   a. *Aromatic Errhines.*—Lavender, Marjoram, Sage, Spices, &c., reduced to powder.
   b. *Acro-sedative Errhines.* — Tobacco, Euphorbium, Veratrum, Asarum, &c.

ii. *Augmenting the salivary Secretion. — Sialogogues.*
   a. *Local Sialogogues—Masticatories.*—Mezereon, Pellitory of Spain, Horseradish, Ginger, Betel Nuts, Betel Leaf, Mustard, Tobacco, &c.
   b. *Remote or contingent Sialogogues.*—Acting through the medium of the circulation—preparations of Mercury, of Iodine, of Gold. Foxglove, Hydrocyanic Acid, Nitric Acid, &c., in rare instances.

iii. *Provoking the discharge of the contents of the Stomach, and increasing the secretions from its villous surface.—Emetics—Vomits.*—The biliary and pancreatic secretions are also frequently increased by the operation of emetics.
   a. *Vegetable Emetics.*—Ipecacuanha, Tobacco, Mustard, and other vegetable irritants, taken in large doses.
   b. *Mineral Emetics.* — Emetic Tartar, Sulphate of Zinc, Sulphate of Copper.

Of these Tobacco and Emetic Tartar are the most depressing: often so depressing as to be injurious or even poisonous. They ought never to be given in states of vital exhaustion or Narcotism.

iv. *Producing Alvine Evacuations.—Purgatives—Cathartics.*
   a. *Laxatives or Lenitives, Mild Aperients.*—Manna, Cassia pulp, Tamarinds, Prunes, Almond and Olive Oils, Magnesia, Bitartrate of Potash.
   b. *Cooling Antiphlogistic or Saline Purgatives.*—The Sulphates of Soda, Potash and Magnesia, Citrate of Magnesia, Tartrate of Potash.
   c. *The milder Purgatives.*—Sulphur, Senna, Rhubarb, Aloes, Castor Oil.
   d. *Chologogue Purgatives, Alterative or Mercurial Purgatives.* — Calomel and other preparations of Mercury. Bitartrate of Potash in large doses.
   e. *Drastic or Acrid Purgatives—Hydragogue Cathartics.*—Jalap, Scammony, Gamboge, Black Hellebore, Colocynth, Sulphate of Potash, Elaterium, Croton Oil.

v. *Promoting the Excretion of Urine.—Diuretics.*—Acting chiefly through the medium of the Blood.
   a. *Acid and Saline Diuretics.*—The dilute Mineral and Vegetable Acids, the Carbonates of the Alkalies, the Vegetable Salts of the Alkalies, especially the Bitartrate and the Acetate of Potash, the Citrates of Soda, Potash, and Magnesia, the Nitrates of Potash and Soda.
   b. *Irritant Diuretics.* — Squills, Common Broom, Cantharides, Juniper, Turpentines, and Balsams.
   c. *Sedative or Depressing Diuretics.*—Digitalis, Colchicum, Tobacco.
   d. *Alcoholic and Etherial or Stimulant Diuretics.*—Dilute Spirit, Gin, Ale, the Nitric and other Ethers.

vi. *Promoting Cutaneous Transpiration.—Diaphoretics.*
   a. *Diluent or Aqueous Diaphoretics.*—Warm fluids, Whey, Tea, Gruel, Broths, &c.
   b. *Saline, Antimonial or Cooling Diaphoretics.*—Acetate, Citrate, and Carbonate of Ammonia; Alkaline Citrates and Tartrates, Nitrate of Potash, Sulphur, Sal Ammoniac, the preparations of Antimony, weak solutions of Camphor.
   c. *Opiate Diaphoretics.*—Opium, Morphia, and their preparations, conjoined chiefly with Ipecacuanha, or with one or more of the foregoing, or with the Ethers.
   d. *Warm or Stimulating Diaphoretics.*—The preparations of Ammonia, Sassafras, Mezereon, Guiacum, Camphor in full doses, Spirits or Alcoholic fluids, the Etherial preparations, Coffee.

vii. *Promoting the discharge from the Bronchi and Trachea.—Expectorants.*

a. Vapours inhaled into the Lungs.—The dilute vapour of Turpentine, or of Tar, or of Creasote, or of Camphor, or of Iodine, or of Benzoic or Acetic Acid; the smoke of Stramonium, or of Tobacco.

b. Stimulating Expectorants, acting chiefly by the Organic Nervous System and the Blood.—Camphor, the Gums and Gum-resins, [Oleo-resins], the Balsams, Ammoniacum, Squills, Senega, Garlic, Onions, Sulphur.

c. Nauseating or Emetic Expectorants.—Depressing Expectorants.—Preparations of Antimony, of Ipecacuanha, Lobelia inflata, Tobacco, [Alum, Turpeth Mineral].

viii. *Exciting the Catamenial Discharge.—Emmenagogues.*

a. Purgative Emmenagogues.—Acting chiefly on the lower Bowels. Aloes, Gamboge, Colocynth, Calomel, Black Hellebore.

b. Diuretic and Stimulating Emmenagogues.—Savine, Juniper, Rue, Cantharides, the fetid Gums, Castor, the preparations of Iron, Myrrh, &c.

c. Acting more directly on the Uterus.—More frequently restraining hæmorrhage from the uterus by exciting contractions of its parietes, than favouring a discharge from it. Ergot of Rye, Biborate of Soda, Oil of Turpentine, [Black Cohosh].

Class IX. Exciting the Cerebro-Spinal Nervous System.—Nervous and Muscular Excitants.—Nux Vomica and Strychnia, and plants containing Strychnia, Brucia Antidysenterica, Coculus Indicus, [Rhus toxicodendron], Coriaria Myrtifolia, &c., &c.

Class X. Irritating and Depressing Medicines—Irritating and Paralyzing.—Acro-Sedatives. — Substances which irritate the tissues, and depress organic nervous or vital power.

i. *Mineral Acro-Sedatives.*—Arsenic and its compounds. Tartar Emetic and Antimonial preparations. Cupreous substances: Baryta and its Salts; Sulphate of Potash in large doses, Oxalate of Potash, Chromate of Potash, the Sulphurets, Tartaric Acid.

ii. *Vegetable Acro-Sedatives.*—Aconite and its preparations. Colchicum autumnale, Hellebore and its species, Digitalis, Indian and Virginian Tobacco, Castor Seeds, Jatropha Manihot, Veratria, &c.

Class XI. Irritating and Alterative—Acro-Alterant Medicines.

i. *Mineral Acro-Alterants.*—Chlorine and the Chlorides. Chlorate of Potash; the Hypochlorides. Iodine and its compounds, Iodide of Iron, of Mercury, of Arsenic, Bromine, Mercury and its preparations, Arsenic, &c. The Alkalies.

ii. *Vegetable Acro-Alterants.*—Iodine, Bromine, the Thorn-apple, Conium, Belladonna, Benzoin, Camphor, Turpentine and the Terebinthinates and Balsams, Tar, and Tar Water.

Class XII. Altering Vital Actions.—Alterants—Deobstruents.—Changing the state of the secretions, and of the nutrition of certain textures and organs, according to the substance employed and the mode of employment.

i. *Mineral and Metallic Alterants.*—Sulphur, Magnesia, the Carbonates of the Alkalies, the preparations of Iron, of Mercury, of Iodine, of Arsenic, &c.

ii. *Vegetable Alterants.*—Taraxacum, Carbon, Sarsaparilla, Sassafras, Citric Acid, and Citrates; the preparations of Iodine, especially the Iodides.

iii. *Animal Alterants.*—Cod and Torsk Liver Oil. Ox-gall.

Class XIII. Stupefying or Narcotizing the Nervous Systems.—Narcotics.—Hypnotics.—Anæsthetics.

i. *Gases and Vapours, especially when inhaled.*—Carbonic Acid Gas, Carburetted Hydrogen Gas, Sulphuretted Hydrogen. The vapour of Chloroform, or of the Ethers, or of Alcohol.

ii. *Vegetable Narcotics.*—Opium, Morphia, and their preparations. The smoke of Opium, Henbane, Cicuta virosa, Poppy, Hops, Hemlock-dropwort, Lollium temulentum, Canabis Indica (an uncertain narcotic).

Class XIV. Affecting the states of the Blood and Capillary Blood-vessels.—Hæmato-cathartica.—Hæmapharmaca.

i. *Altering the Appearance and Condition of the Blood.—Blood-medicines.*—The Alkaline Carbonates, Magnesia and its Citrate, the Nitrate, Citrate, and Chloride of Potash; the Chlorate of Potash; the Nitrate, Citrate, and Chloride of Soda; Chloride of Sodium; Alkaline Solutions, Sulphur, weak or dilute Acids, Chlorine and Chlorinated solutions and waters, Nitro-hydrochloric acids, Citric Acid. The preparations of Iron; Chalybeate and Mineral springs and artificial Mineral waters.

ii. *Constringing the Capillary Blood-vessels, and altering the state of the Blood circulating in them.*—The Mineral acids, the diacetate of Lead, the Spirits of Turpentine, the Ergot of Rye, the Gallic and Tannicc Aids, Matico, Creasote.

[It is now admitted that many medicinal substances enter the blood, and produce important changes in its physical and vital condition, upon the tissues generally, and especially the excreting organs. Of the changes effected in the blood itself we are as yet mainly ignorant, yet we may not doubt that physical, chemical, and vital effects are produced in the corpuscles, or that the composition of the plasma is influenced in an important manner. The action of medicines and poisons is the same. Some moderate the course of the blood by more or less coagulating the serum, as nitric acid, alcohol, creasote, the metallic salts, &c. Some liquefy the blood and accelerate its course, as the acetate of ammonia, nitrate and probably all the salts of potash, the iodides, bromides, &c. Some modify the chemical reactions which take place in this liquid, as by seizing its oxygen, thus preventing hæmatosis, and producing chlorosis, anæmia, &c., as sulphuretted hydrogen and hydrocyanic acid; while, lastly, some produce abnormal chemical reactions in it, as the poison of rabid animals, serpents, &c. (*Mialhe.*) *Diluents* lower the specific gravity of the plasma, by increasing the proportion of its fluid parts. *Inspissants* produce the opposite effect. *Spanæmics* are agents, which, by long-continued use, impoverish the blood, as iodine, bromine, most of the metals (iron excepted), acids, alkalies, and earthy salts. Mercury and antimony possess this property, perhaps, in the greatest degree, acting as resolvents and liquefacients. *Arsenic* (which, from veterinary practice, has recently begun to

be used by American females to improve their skin and complexion, and impart a healthy look) would seem to act like iron, as a general alterative and tonic. *Hæmatinics* augment the amount of *hæmatin* in the blood, as *iron*.—See *Pereira*, vol. i., p. 226.]

Class XV. Inducing Contractions of the Uterus.—Parturifacients.—Parturients.—Ergot of Rye, Biborate of Soda, Spirits of Turpentine, in full doses or in enemata.

Class XVI. Expelling Worms and preventing the Formation of Worms.—Anthelmintics.

i. *Mechanical Anthelmintics.*—Filings of Iron, Granular Tin, Cowage, &c., followed by drastic purgatives.

ii. *True Anthelmintics.*—Substances poisonous to parasitic animals.—Oil of Turpentine, Tar and Tar-water, Creasote, Animal oil or Dippel's oil; Chenopodium or Worm-seed, or its oil; Spigelia or Pink-root, Male fern, bark of Pomegranate root, bark of the root of Azedarac, Fucus helminthocorton, Corsican Wormweed, Tanacetum vulgare, common Salt, Kousso.

iii. *Purgative Anthelmintics.*—Calomel, Jalap, Scammony, Castor oil, Aloes, Hellebore.—Most efficacious when following the exhibition of the preceding.

iv. *Medicines preventing the formation of Worms.*—Asafœtida, Myrrh, the preparations of Iron, Tar-water, Charcoal; Quassia, and bitter tonics.

Class XVII. Preventing or correcting a Tendency to a Dissolution of the Tissues, or to a Solution of the Vital Cohesion of Textures.—Antiseptics.

The substances classed as *Astringents* and *Tonics* (Class IV.) are also more or less *Antiseptic*.

i. *Mineral Antiseptics.*—The Chlorides of the alkalies, the Hypo-chlorides, Chlorine and Chlorinated fluids, the Chlorides of the metals and of the metalloids, the Tincture of the Hydrochloride of Iron, the Chloride of Zinc, the Mineral acids.

ii. *Vegetable Antiseptics.*—Tar, Turpentine, Tar-water, Creasote, Charcoal, Camphor, the astringent and tonic Barks, Quina, Beebirine, Tannin, Gallic, and Gallic Acids.

Class XVIII. Neutralizing Acidity, removing or preventing Antacids.—Sorbefacients.

i. *Direct Antacids.*—The Alkalies and Alkaline Carbonates, the Carbonates of Iron, of Zinc, of Bismuth, Magnesia, Lime, and their Carbonates, Lime-water.

ii. *Indirect Antacids.*—The Mineral acids, Tonic and Bitter infusions, Tonic Mineral salts, Sulphate of Quina, &c.

Class XIX. Destroying, or removing, or counteracting an infectious Seminium or Miasms.—Disinfectants.

i. *Destructives.*—Heated air from 180° to 254°.—This is the only real disinfectant.* All other substances which have been extolled as disinfectants act merely by *removing* offensive odours, or by *fortifying* persons exposed to infection against its invasion. The medicines enumerated in Classes IV., VII., and XVII., by increasing the vital tone and cohesion of the tissues, enable the body to present a greater or less resistance to the impressions made by infectious miasms, and in this they are aided by mental excitement and confidence, and by the several stimulants and tonics, when these are so employed as not to be productive of consecutive exhaustion.

[ii. *Deodorizers.*—*Charcoal* absorbs all putrescent effluvia. *Lime* absorbs carbonic acid, sulphuretted hydrogen, &c. *Nitrous fumes* destroy many putrescent odours, and decompose, by their oxidizing power, several of the gases evolved by putrefying animal matters. Several *metallic salts* are deodorizers, and perhaps disinfectants, as they react on sulphuretted hydrogen and the hydrosulphurets, forming insoluble, inodorous, metallic sulphurets, and also unite with animal matters and check putrefaction. Such are the *nitrate of lead* (*Ledoyen's disinfecting fluid*), in the proportion of ʒj. to ʒj. of water; also the *acetate of lead, chloride of zinc* (*Burnett's disinfecting liquid*), the *persalts of iron*, and *sulphate of copper*.]

In the above attempt at classifying Therapeutical Agents, I have departed far from previous arrangements. Certain *Classes* or *Orders* have been created, while others have been omitted. Of the former there is little to be remarked, and that little will be seen by the reader who is acquainted with the subject. I have omitted the *Class Antispasmodics*, because there is really no class of medicines which possesses the property of directly arresting spasm; substances which have acquired this appellation possessing their only claims to it by their contingent action on the morbid conditions productive of spasm. Some writers have created a class of *Revellants*, or *Counter-irritants*; but revulsion, or counter-irritation, is merely the employment of means comprised in Classes V., VII., and VIII., in such a manner as to induce irritation and consecutive vascular determination to parts at a distance from the seat of morbid action, or to solicit an increased flow of blood to viscera or organs, by promoting or exciting their functions. It will be perceived that I have arranged several substances under more than one class. This necessarily follows the varying and even different action of the same substance, according to its dose and modes of exhibition or combination. For very enlightened views as to the operation and classification of Therapeutical Agents, I may refer the reader to the more recent works on Therapeutics and Materia Medica enumerated in the Bibliography.*

* [As *chlorine* has the property, from its strong affinity for hydrogen, with which it unites, forming hydrochloric acid, of decomposing sulphuretted hydrogen, ammonia, hydro-sulphuret of ammonia, phosphuretted hydrogen, and other fetid and offensive vapours, it is generally considered to be a true disinfectant, although, from its irritating and corrosive properties, it is often objectionable when employed in the sick-room. The hypochlorites have the same power (as the hypochlorite of soda), which are employed in solution, and to which the same objections do not apply. It remains, however, to be proved that chlorine and its compounds decompose all miasmata.]

* [The more the above essay on Therapeutics is examined, the more convinced will the reader be that it is one of the most comprehensive and philosophical ever given to the public on this subject. It embraces all the facts hitherto established in regard to the indications for the cure of disease, and the means by which they are to be fulfilled. Unbiased by theory, the author has embraced in his view all the considerations flowing from legitimate solidism and modern humoralism, and while doing justice to both, he has reconciled conflicting statements and doctrines, in such a manner as will satisfy the adherent of either system. Whoever candidly studies this essay, will not only feel a just pride in the

BIBLIOG. AND REFER.—*Hippocrates*, Περὶ τόπων τῶν κατ' ἄνθρωπον, p. 417.—*Aristotle*, De Animalibus Hist., l. x., 4 tom., 8vo. Lips., 1811; et Philosoph. Medicorumque problemata, 12mo. Lond., 1583.—*Theophrastus*, Opera, &c.—*Dioscorides*, Opera quæ extant omnia, fol. Francf., 1598.—*Celsus*, De Medicina, *pluries*.—*Scribonius Largus*, De Compositione Medicamentorum, fol. Ed. Princep., 1519; et 12mo. Basil., 1529; et Compositiones Medicæ. *J. Rhodius*, recensuit, notis illustravit, Lexicon Scribonianum adjecit, 4to. Patav., 1655. (The first Pharmacopœia; but very difficult to be understood, without the notes and lexicon of Rhodius.)—*C. Plinius secundus*, Naturæ Historiarum, Libri xxxiii., fol. Hag., 1518; et cum Notis Variorum, Edit. Valpy, 8vo; tom. xii., 8vo. Lond., 1826.—*Galenus*, Opera, *pluries*.—*Cœlius Aurelianus*, Method. Methodicorum dirigens Omnia, &c., Op., p. 275, *et pluries*.—*Oribasius*, Medic. Collect., l. vii., *passim*.—*Paulus Ægineta*, Opus de Re Medica, fol. Colon., 1534. The Seven Books of *P. Æ.*, transl. from the Greek, with a Commentary embracing a complete view of the Knowledge possessed by the Greeks, Romans, and Arabians on all Subjects connected with Medicine and Surgery, by *E. Adams*, 3 vols., *for Sydenham Society*, 8vo. Lond., 1844.—*Aëtius*, Tetrabiblos, *passim*.—*Alexander Tralianus*, De Morbis et Febribus, fol. Basil., 154.—*Actuarius*, Method. Med., l. iii., et Opera de Act. et Spirit. Animal. Paris, 1556, *passim*.—*Mesue*, De Morbis Internis Curandis, 8vo. Ludg., 1551.—*Avicenna*, Canones, 4to. Venet., 1700.—*I. M.*, Regimen Sanitatis Salernitana. *A. Croke*, Ed., 8vo, &c.—*I. de Gaddesden*, Rosa Anglica, seu Practica Medicinæ, fol. Pavia, 1492.—*Gilberus Anglicus*, Compendium Medicinæ, 4to. Lion., 1510. Schola Salernitana, sive de Conservanda Valetudine Præcepta Metrica, A. I. de Mediolano, 12mo. Rot., 1667.—*Arnoldus de Villa Nova*, Opera, p. 36, 101, 118, et Regimen Sanitatis, 4to. Paris, 1505.—*Gavasetti*, De Indicationibus Curativis. Venet., 1586.—*J. Werner*, Therapeutica, h. e., Sanitatis restituendæ Ratio Artificiosa, l. ii., 8vo, 1596.—*Fernelius*, in Method. Med., l. i.-viii.—*I. Fontanus*, Method. Generis cognoscendi et curandi Morbos, 8vo. Aven., 1601.—*J. Renealmi*, Ex Curationibus Observationes, quibus videre est, Morbos cito, tuto et jucunde posse debellari, si Galenicis Præceptis Chymica remedia veniant subsidio, 8vo. Paris, 1616.—*I. Sporisch*, Libri vi., de Ratione curandi in ægris Hominum Corporibus Morbosque horum per Diætam, 8vo. Lips., 1617.—*Santa Cruz*, De Impedimentis magnorum Auxiliorum in Morborum Curatione, l. iii., 12mo. Patav., 1652.—*H. Cortes*, Summa medendi Methodus, 4to. Venet., 1658.—*T. Willis*, Pharmac. Ration., p. i., 8vo. 1674.—*J. G. Sartorii*, Compend. medendi Methodus, 4to. Alt., 1682.—*J. Floyer*, Φάμακο-Βάσανος; or, the Touchstone of Medicine, 2 vols. 8vo. 1687.—*G. Bate*, Pharmacopœia Bateana, by Fuller, 12mo. 1691.—*S. Dale*, Pharmacologia: seu Manuductio ad Mat. Med., 8vo. 1693.—*J. Quincy*, Pharmacop. Officinalis et extemporanea, &c. 1718.—*F. Hoffman*, Opera et Supp., *pluries*. Stahl. Opera, Halæ, *passim*.—*Burggrav*, De Methodo medendi pro Climatum Diversitate varia instituenda. Lugd. Bat., 1724.—*R. Bradley*, A Course of Lectures on the Mat. Med., &c., 8vo. 1730.—*Alberti*, De Therapia Morborum Morali, Halæ, 1714; De Cura per Expectationem, Hal., 1718; De Therapia Imaginaria, 1721; De Abstinentia a Medicamentis et Medicis Morbos et Mortem interdum avertente, 1722; De Morum et Remediorum Nexu, 1728; De sanatione divitum Difficili, 1731; De Curatione per contraria, 1732; De Curatione per Similia, 1734; De Ægris Medicinæ Abstemiis Diætetice Curandis, 1744. (These and other Dissertations of *Alberti* are well deserving perusal.)—*R. James*, Pharmacop. Universal, or a New English Dispensatory, 8vo. 1747.—*W. Lewis*, The New Dispensatory, 8vo. 1754. (Edited after his death by several Physicians, and ultimately became the Edinburgh New Dispensatory.)—*J. Juncker*, Therapia Generalis, 4to. Halæ, 1736.—*Otto*, Historia Generalis quomodo cito, tuto et jucunde Medendum. Lips., 1746.—*G. Cheyne*, The Natural Method of curing the Diseases of the Body and the Disorders of the Mind depending on the Body, 8vo. Lond., 1752.—*B. Robinson*, Observations on the Virtues and Operations of Medicines, 8vo. Lond., 1752.—*B. Swalwe*, Therapia Generalis, 12mo. Amst., 1757.—*S. Schaarschmid*, Therapia Generalis, oder Abhandlung von den üblichen Arzeneien, 8vo. Berlin, 1755.—*J. Barker*, Essay on the Agreement between Ancient and Modern Physicians; or, a Comparison between the Practice of Hippocrates, Galen, Sydenham, and Boerhaave in acute Diseases, 8vo. Lond., 1747.—*A. Schaarschmid*, Begriff der allgemeinen Kurmethode in der practischen Medicin. Berlin, 1770.—*J. Whiters*, Observations on the Abuse of Medicines, 8vo. London, 1775.—*J. Brown*, Elementa Medicinæ, 8vo. 1780.—*F. Home*, Methodus Mat. Med., 12mo. Edin., 1781—et Clinical Experiment. Hist. and Dissert., 8vo. Edin., 1783.—*C. G. Bœhms*, Umriss der allgemeinen Heilungskunde. Berlin, 1785.—*J. D. Metzger*, Grundsätze der allgemeinen Semiotik und Therapie. Königsb., 1785.—*J. Bayer*, Grundriss der allgemeinen Hygieine und Therpentik. Prag, 1788.—*J. Gregory*, Conspectus Medicinæ Theoreticæ, 8vo. Edin., 1782. (Many Editions subsequently.)—*R. Home*, The Efficacy and Innocence of solvents candidly examined, &c., 8vo. Lond., 1785.—*G. G. Plouquet*, Fundamenta Therapiæ Catholicæ, 8vo. Tübing., 1785.—*J. C. Juncker*, Versuch einer allgemeinen Heilkunde. Hal., 1788.—*W. Cullen*, Treatise of the Materia Medica, 2 vols. 4to. Edin., 1789. (Believed that Medicines acted by means of the nervous system.)—*Z. G. Baldinger*, Literatura Universa Materiæ Medicæ, Alimentariæ, Toxicologicæ, Pharmaciæ et Therapeia Generalis, &c., 8vo. Marb., 1793.—*B. Carminati*, Hygiene, Terapeutice et Mat. Med., 4 vols. 8vo. Papia, 1791-95.—*J. C. Tode*, Die allgemeine Heilkunde oder die Lehre von den Heilungsanzeigen, 8vo. Kopenhagen, 1797.—*J. S. Vaume*, Traité de Méd. Pratique et sur les Remèdes Généraux, &c. Paris, 1798.—*J. C. G. Ackermann*, Institutiones Therapiæ Generalis. Norimb., 8vo, 1794.—*C. W. Hufeland*, System der practischen Heilkunde. Jenæ, 1800.—*A. F. Hecker*, Therapeia Generalis, 8vo. Berlin, 1789—et Kurzer Abriss der Therapie, 8vo. Berlin, 1807.—*Von Hoven*, Grundsätze der Heilkunde. Rothenb., 1807.—*W. P. C. Barton*, Vegetable Mat. Med. of the United States, 2 vols. 4to, fig., 1817-18.—*J. Bigelow*, American Med. Botany, 2 vols. 8vo. Boston.—*J. Eberle*, Treatise on Mat. Med. and Therapeutics, 2 vols. 8vo, 2d ed. 1824.—*A. P. De Candolle*, Essai sur les Prop. Méd. des Plantes, 8vo. Paris, 1804; 2d edit., 1816.—*J. L. Alibert*, Nouv. Elémens de Thérapeutique, 2 t., 8vo. Paris, 1804; 5me ed., 1826.—*J. B. G. Barbier*, Princip. Génér. de Pharmacol. Traité Elém. de Mat. Med., 8vo. Paris, 1805; 2de edit., 3 vols. 8vo. Paris, 1824.—*F. L. Alibert*, Nouveaux Elémens de Therapeutique et de Mat. Méd., &c., 8vo. Paris, 1804.—*J. Murray*, System of Mat. Med. and Pharmacy, 2 vols. 8vo. 1804; 5th edit., 1828.—*A. F. ad Hecker*, Kurzer Abriss der Therapie, 8vo. Berlin, 1807.—*J. L. Augustin*, Handbuch der medicinischen Therapie, 8vo. Berlin, 1806.—*Reil u. Hoffbauer*, Beiträge zur Beförderung einer Kurmethode auf Psychischem Wege. Halle, 1807.—*K. G. Neumann*, Allgemeine Therapie. Leipz., 1808.—*A. T. Thomson*, Conspectus of the Pharmacopœias. 1810; 13th ed., 1841. London Dispensatory, 8vo. 1811; 9th edit., 1837.—*F. Berard*, Plan d'une Médecine Naturelle, ou la Nature considerée comme Médecine, &c. Montp., 1810.—*J. W. H. Conradi*, Grundriss der Pathologie und Therapie, 8vo. Marb., 1811.—*Friedlander*, De Methodi Stimulantis Abusu, crebra Exitus funesti in Morbis acutis Causa. Giessæ, 1810.—*P. J. Horsch*, Handbuch der allgemeinen Therapie, 8vo. Würzb., 1811.—*J. P. Frank*, De Curand. Hom. Morbis, l. v.—*J. A. Paris*, Pharmacologia, 8vo. 1812; 9th ed., 1838. (A very Classical work.)—*K. H. Burdach*, Die Literatur der Heilwissenschaft, 3 b., 8vo. Gotha, 1810-21.—*S. F. Gray*, Supplement to the Pharmacopœias, 8vo. 1818; 6th edit., 1836.—*J. D. Reuss*, Repertorium, &c., t. xvi., 4to., Götting., t. xi., *Therap. et Mat. Med.*—*C. Sprengel*, Institutiones Medicæ, vi. Tomi., 8vo, tom. vi., pars prima. Therapia Generalis. Lips., 1816.—*N. Chapman*, Elements of Therapeutics and Materia Medica, 2 vols. 8vo. Philad., 1821. Rev. in Med. Chirurg. Rev., vol. iv., p. 61.—*W. Ainslie*, Materia Medica of Hindostan, 2 vols. 8vo. 1826.—*J. Roques*, Pytographie Médicale, 2 vols. 4to. Paris, 1821. (Plates beautifully coloured.)—*J. Begin*, Traité de Therapeut., 8vo, 2 vols. Paris, 1825.—*A. Chevallier*, *A. Richard*, et *J. A. Guillemin*, Diction. des Drogues, &c., 8vo, 5 vols. Paris, 1827-29.—*A. J. L. Jourdan*, Pharmacopée Universelle, 2 vols. 8vo, 1828; 2d ed., 1840.—*L. Martinet*, Manuel de Therapeutique et de Mat. Méd., 8vo. 1828.—*J. Stephenson* and *J. M. Churchill*, Medical Botany, 4 vols., fig. 8vo. Lond., 1831.—*J. Pereira*, Lectures on the Mat. Medica and Therapeutics, in London Medical Gazette, for 1835-37. The Elements of Materia Medica and Therapeutics, 2 vols. 8vo. Lond., 1839-40; 2d edit., 1842.—*R. Christison*, A Dispensatory or Commentary on the Pharmacopœias of Great Britain, 8vo. Edin., 1842.—*Simon*, in Journ. des Progres des Sciences Med., t. x., p. 104.—*M. C. Petit*, in Ibid., t. xvii., p. 178.—*Moreau de Jonnès*, in Mém. de la Soc. Méd. d'Emulation, t. viii., p. 175.—*Hecker*, in Medico-Chirurg. Rev. July, 1838, p. 265.—*J. H. Royle*, in Journ. of the Asiatic Society of Bengal. 1832.—*G. G. Sigmond*, Lectures on the Mat. Med. and Therapeutics, in Lancet for 1836-38.—*A. Ure*, Pract. Compend. of Mat. Med. for Infancy and Childhood. 1838.—*J. H. Lane*, Compend. of Mat. Med. and Pharmacy, 8vo. 1840.—*A. L. J. Bayle*, Bibliothèq.

vast resources of scientific medicine, but will be effectually guarded against all inclination to the plausible systems of quackery and delusion so lamentably prevalent in our country.]

de Therapeut., 4 tom. Paris, 8vo, 1828-37.—*F. V. Merat et A. J. de Lens*, Dict. Univers. de Mat. Méd., 6 vols. 8vo. Paris, 1829-34.—*C. P. Galtier*, Traité de Mat. Méd. et des Indications Therapeutiques, &c., 8vo. Paris, 1839.—*H. M. Edwards and P. Vavasseur*, Manuel de Mat. Méd., 8vo. Paris, 1826. Translated by *J. Davies*. London, 1827.—*G. Giacomini*, Trattato filosofico sperimentale dei soccorsi Therapeutéci, 4 vols. 8vo. Padova, 1833.—*G. B. Wood* and *F. Bache*, The Dispensatory of the United States, 8vo, 3d ed. 1836.—*W. B. O'Shaughnessy*, The Bengal Dispensatory and Pharmacopœia, &c., 8vo. Calcutta, 1841.—*E. Ballard* and *A. B. Garrod*, Elements of Mat. Med. and Therapeutics, 8vo. Lond., 1845.—*A. Bouchardat*, Annuaire de Therapeutique, de Mat. Méd., &c., 12mo. Paris, 1846-50.—*J. Carson*, Illustrations of Medical Botany, consisting of col. fig. of Plants affording important Art. of Mat. Med., &c., 4to. Philad., 1847.—*C. G. Mitscherlich*, Lehrbuch der Arzeneimittellehre, 8vo. Berlin, 1847.—*F. Oesterlen*, Handbuch der Heilmittellehre, 8vo. Tübingen, 1845.—*A. Richard*, Eléments d'Hist. Nat. Méd., &c., 4to. Paris, 1849. (Many Plates.)—*J. F. Royle*, Mat. Med. and Therapeutics, including the Preparations of the Pharmacopœias of London, Edinburgh, and Dublin, with many new Medicines, 12mo. Lond., 1846. Edition, also, with the Pharmacopœia of the United States, by *J. Carson*, 8vo. Philad., 1847.—*A. Trousseau* and *H. Pidoux*, Traité de Therapeutique et de Mat. Méd., 3me edit., 8vo. Paris, 1847.—*R. Dunglison*, General Therapeutics and Materia Medica adapted for a Medical Text-book, with numerous Illustrations, 2 vols., 4th ed., 8vo. Philad., 1850.—*F. W. Headland*, An Essay on the Action of Medicines on the System, &c., 8vo. Lond., 1852.

[Am. Bibl. and Ref.—*John P. Harrison*, Elements of Materia Medica, 2 vols. Philad., 1845.—*Martyn Paine*, The Institutes of Medicine. New York, 1847, p. 826; and Therapeutical Arrangement of the Materia Medica, 12mo. New York.—*J. Carson*, Am. ed. Pereira's Elements of Materia Medica, 3d Am. ed.; and Synopsis of Lectures on Materia Medica, 8vo, p. 208. 1855.—*Alfred Stillé*, Principles of General and Special Ther., 8vo. Phil., 1856.—*Edward Parish*, A Pract. Introduction to Pharmacy, 8vo. Phil., 1856.—*D. M. Reese*, Am. ed. of J. M. Neligan's Medicines, their Uses and Mode of Administration, &c., 8vo. New York, 1850.—*W. Leo Wolf*, Remarks on the Abracadabra of the 19th century, 8vo. New York, 1840.—*Asa Gray*, Botan. Text-book, 12mo. New York.—*J. Togno* and *E. Durand*, Am. edit. of H. M. Edwards and P. Vavasseur's Manual of Mat. Medica and Phar., 8vo.—*B. Smith Barton*, Am. ed. of Cullen's Mat. Med., 2 vols. 8vo. Phil.—*J. Thacher*, The American New Dispensatory.—*H. Coley*, A Treat. on Poisons, &c., 8vo. New York.—*J. Torrey* and *A. Gray*, A Flora of North America, &c., 8vo.—*C. Ticknor*, A Treatise on Medical Philosophy, 12mo. New York.—*J. Stewart*, A Practical Treatise on Diseases of Children.—*G. W. Carpenter*, Essays on the more important articles of the Mat. Medica, &c., 8vo.—*E. J. Coze*, A Practical Treatise on Med. Inhalations, &c., 18mo.—*A. Eaton* and *J. Wright*, North Am. Botany, &c., 8vo.—Eclectic and General Dispensatory, comprehending a System of Pharm., Mat. Med., &c. By an American Physician, 8vo. New York.—*J. A. Gallup*, Outlines of the Institutes of Medicine, 2 vols. 8vo.—*Geo. B. Wood* and *Franklin Bache*, The Dispensatory of the United States.—*R. E. Griffith*, Medical Botany and Universal Formulary. Phil., 1855. Am. ed. Christison's Dispens., 2d ed. 1855.—*B. Ellis*, The Medical Formulary, 10th edit. Phil., 1855.—*Robley Dunglison*, Gen. Ther. and Mat. Med., 5th edit., 2 vols. 8vo, 1855; and New Remedies, with Formulæ for their Administration, 6th ed., 8vo. Phil., 1855.—*Jacob Bigelow*, Am. Med. Botany, 2 vols. 8vo. Boston. (60 coloured Plates.) Florula Bostoniensis, and Sequel to U. S. Pharm. 1822.—*Wm. P. C. Barton*, Veg. Mat. Med. of the United States, 2 vols. 4to., fig. 1817-18; and Outlines of Lectures on Materia Medica and Botany, 2 vols. 12mo. Phil.—*J. Eberle*, A Treatise on the Mat. Med. and Therapeutics, 8vo, 2d edit. 1824.—*W. Chapman*, Elements of Ther. and Mat. Med., 2 vols. 8vo. Phil., 1821.—*Chas. A. Lee*, Am. edition of Thomson's Conspectus, 18mo, and of Paris's Pharmacologia, 9th edit. New York, 1844. Catalogue of Medicinal Plants, indigenous and exotic, growing in the State of New York, 8vo.—*John Bell*, A Practical Dict. of Mat. Med., 8vo. Phil.—*Lewis C. Beck*, Adulterations of various substances used in Medicine and the Arts, &c., 12mo. New York, 1850.—*J. J. Reese*, The Amer. Med. Formulary, based upon the United States and British Phar., &c., 12mo. Phil.—*Wm. Proctor, Jr.*, Am. edition of Mohr and Redwood's Practical Pharmacy, 8vo. 506 Engravings. Phil.—*T. D. Mitchell*, Materia Med. and Therapeutics, 8vo. Phil.—*J. B. Beck*, Essays on Infant Therapeutics, &c., 12mo. New York, 1851.—Lectures on Materia Med. and Ther., 8vo. New York.—*J. C. Warren*, Etherization with Special Remarks, 8vo. Boston.—*W. Channing*, On Etherization, 8vo. Boston, 1852.—*O. W. Holmes*, Homœopathy and its kindred Delusions, 12mo. Boston.—*C. S. Rafinesque*, Medical Flora, or Manual of the Med. Botany of the United States. 100 Plates. 2 vols. 12mo.—*A. Wood*, A Class-book of Botany, with a Flora of the Northern States. 38 Engravings. 12mo.—*J. Darby*, A Manual of Botany, adapted to the Productions of the Southern States. 145 Engravings. 12mo.—*J. R. Coxe*, The American Dispensatory, containing the Natural, Chemical, Pharmaceutical, and Medical History of the different substances employed in Medicine, &c., &c., 8vo.—*William Tully*, Materia Medica and Therapeutics. Springfield. 9 Nos. published, 64 pages in each No.: to be continued: a very learned work.—Am. Edit. of Cullen's Mat. Med. New York, 1802; and B. S. Barton's ed. Philadelphia, 1812.—*Ives's* ed. of J. Murray's Mat. Medic. New York, 1844; and Chapman's edit. of same. New York, 1821.—*John Warren*, On Mercurial Practice. Boston.—*P. S. Physick* and *Leybert* (Experiments on the absorption of Medicines), Med. Repository, New York, vol. v.—*Hodges* (Inaugural Thesis on the absorption of Medicines. 1801).—*Wm. P. Dewees* (On modus operandi of Med.), Amer. Jour. Med. Sci., new Series, 1825, p. 150.—New York Formulæ Selectæ. 1818.—*A. W. Ives's* Am. edit. of Paris's Pharmacologia. New York, 1824.—*Elliott*, Botany of South Carolina and Georgia.—*Edwards* and *Vavasseur's* Man. Mat. Med., translated by Togno and Durand. Phil., 1829.—United States Pharmacopœia, edition 1850.]

THROAT, DISEASES OF — Comprising the Tonsils and Pharynx.

1. *The parts* of which the throat may be said to consist—the *velum* or soft *palate* and *uvula*, the *tonsils* and pillars of the palate, the *pharynx*, and the *root* of the tongue and *epiglottis*—may individually, or severally, or even altogether, be the seat of disease, especially of the various forms and states of inflammation, or of ulceration, or of sympathetic functional disorder. Whether they be individually or conjointly affected, the disease may be either *primary* or *consecutive*—*idiopathic* or *symptomatic*—*simple* or *complicated*—*local*, or *constitutional*, or *specific*; and, as respects the state of vital power, *sthenic*, or *asthenic*, or *phagedenic*, or *gangrenous*. This last or malignant form is generally a manifestation of a general or specific contamination of the circulating fluids, in connexion with reduced or perverted organic nervous power or vital action. It is comparatively seldom that one only of the parts comprised by the generic term, *Throat*, is affected, the others remaining healthy. Most commonly adjoining parts are more or less implicated; and, not infrequently in consequence either of previous disorder of the digestive functions, or of impaired vital power, or of interrupted excretion and morbid states of the blood, the disease extends to all these parts, and even still farther, as to the œsophagus, or to the larynx and trachea—to both the digestive and the respiratory passages, especially during wet and unhealthy seasons and epidemic influences, and in low, humid, and malarious localities. Under the head Palate and Uvula I have treated of *Relaxations* and *Inflammations of these parts*. I have now to consider the *inflammatory and structural changes of the Tonsils* and *Pharynx*, and the *diseases of the throat*, which are not limited to one or other of these, but which often extend also to the palate, and even also to the epiglottis and larynx in one direction, and to the œsophagus in another.

I. Inflammation of the Tonsils.—Syn.—*Tonsillitis*, from *Tonsillæ*, the *Tonsils*.—*Synanche vel Cynanche Tonsillaris*; *Angina Tonsillaris*, Auct. *Angina cum tumore*; *Amygdalite*, Fr. [*Kehlsucht*, Germ. *Esquinancie*, Fr. *Quincy*, Engl.]

Classif.—III. Class, 1. Order (*Author*).

2. Definit.—*Pain or uneasiness in the seats*

of the Tonsils, with redness, enlargment, and often with difficulty of swallowing and fever, terminating in resolution, abscess, or chronic enlargement.

3. The *Tonsils* may be inflamed alone or chiefly, or in connexion with other parts of the throat, most frequently with the fauces or pharynx, or both, especially where affections of the throat are epidemic, or complicate febrile and exanthematous maladies. Both tonsils are generally affected either contemporaneously or in succession. One only is rarely attacked—not more than one in 15 or 20 cases.

4. *A. The causes* of Tonsillitis are nearly the same as those occasioning inflammation of other parts of the throat. The disease is not frequent in young children; it is rare during the period of lactation; but it becomes more and more frequent from five to ten years, and still more so from ten till about 20. From the latter age, or from 25 to 30, its frequency diminishes, until it is rarely seen at ages upward of 50. It is nearly equally prevalent in both sexes; but the male sex generally furnish the greater number of cases, probably from a more frequent exposure to the exciting causes. Seasons of the year, states of weather and locality, favour its prevalence, so much so as to render it epidemic or endemic. Epidemic visitations of the malady have mostly occurred in spring or autumn; and although the disease appears at all seasons, it is most frequent when the weather is cold, wet, or changeable. Cold and humid situations, wooded and miasmatous places, and clay or absorbent soils, favour its prevalence. It affects most frequently persons of a fair complexion and those of the scrofulous diathesis; and it often recurs in the same individual, from exposure to cold or currents of air, especially when overheated or perspiring, or when the digestive functions are disordered.

[When abscess in the tonsils has once occurred, it is very apt to occur again whenever inflammation attacks the organ, and so suddenly does it take place, that remedial measures are seldom effectual in preventing it. Its progress is attended with very great suffering and inconvenience, if not danger, and which are suddenly relieved on the bursting of the abscess. In some individuals, generally of a plethoric habit, attacks of Tonsillitis would seem to be periodical, occurring at certain regular periods, as the spring of the year, or the beginning of winter. Early precautionary measures will, however, in many of these instances, ward off an attack.]

5. *B. The symptoms* of Tonsillitis sometimes commence without any very manifest previous disorder. In other cases they are preceded by slight derangement of the digestive functions; and occasionally by most of the phenomena which usher in other inflammations, especially by chills or shivering, followed by heat of skin, excited pulse, thirst, and headache; or merely by general uneasiness, by want of appetite, and pains or soreness of the limbs. Rapidly following, or even coetanously with these, more or less difficulty of deglutition, and a sensation as if a foreign body were present in the throat, are experienced; and in a few hours, or in one or two hours, a continued pain, at first moderate, sometimes severe or acute, a sense of heat, and a constant desire to swallow, are complained of. Deglutition becomes so difficult and painful as to occasion, in some cases, contorsions or convulsions; and in others it is impossible. A guttural cough, a frequent desire of expuition, or of rejecting the saliva and the increased secretion from the throat; a hoarse and difficult respiration; and obscured, confused, or whispering and guttural articulation, or a voice entirely suppressed or lost, are generally present in the more severe cases. In some instances, when the tumefaction of the tonsils is very great, and the discharge of the secretions from the throat and mouth is difficult, paroxysms of dispnœa, or of threatened suffocation, occur at intervals and heighten the distress and alarm of the patient.

6. When the patient's mouth is opened and the base of his tongue depressed, the tonsils are seen more or less swollen, protruding from between the pillars of the palate, and nearly approaching or even touching each other. The membrane covering them partakes in the inflammation, and is at first red and dry; but it afterward is partially covered by whitish exudations, or by specks or patches of mucus or of lymph, or even by a membraneous coating of these. In some instances, however, the tonsils continue more or less free from exudations, and present a deeper and darker red as the disease proceeds. In most cases the inflammatory appearances are not confined to the tonsils, but extend also to the soft palate and uvula, [sometimes to the larynx and trachea;] and there is every reason to infer, from the extension of pain to the interior of the ear, the crepitations which are heard, and the deafness complained of, that inflammatory changes then extend to the Eustachian tube at least, and even in a slight grade to the interior of the ear. When one only of the tonsils is attacked, the enlargement may be so great as to pass the mesian line and to push the uvula to the sound side. The patient in such cases inclines his head from this side, in order that deglutition may be less painful. When both tonsils are affected, as is most commonly the case, and the swelling is great, the uvula is either thrown backward and is concealed behind them, or it is wedged between and above them and contracted. Frequently the enlargement of the tonsils is so great and so painful as to render it difficult to open the jaws so far as to see the state of the parts; but generally this may be ascertained by the introduction of the finger.

7. In addition to those more strictly local symptoms, others of a more sympathetic nature are often present. These are chiefly flushing of the face, headache, thirst, loss of appetite or nausea, heat and dryness of the skin, scanty high-coloured urine, costiveness. In some cases the patient cannot swallow even fluid food, and a few attempts at deglutition are followed by the forcible rejection of the substances taken, through the nostrils. When this occurs, it may be inferred that the pharynx is also inflamed. The character of the *symptomatic fever* varies remarkably. In persons previously healthy, and in open and high localities, the febrile diathesis is generally *sthenic* or *phlogistic;* but in the delicate or cachectic, and in the inhabitants of large towns, or of low, close, or humid places, the attending fever is of a lower or more *asthenic character*, and the local symptoms are more extended to parts in the vicinity. In a few cases, and these the most robust, the febrile action is very slight, although deglutition may be altogether prevented by the swelling. In such cases the patients complain of hunger from this deprivation.

8. *C.* The *course* and *duration* of Tonsillitis is

usually acute, and generally extends from seven to fourteen days. The disease may *terminate* in five or six, and it is rarely prolonged to twenty-one days. The symptoms commonly become more and more severe during the first third or half of their duration; they then continue stationary for a time, and subside afterward with greater or less rapidity. When the disease is slight or moderate, or when the case is early and judiciously treated, then resolution takes place and the swelling gradually and quickly subsides. But in the more severe attacks suppuration commonly supervenes in one or both tonsils; and is indicated by a change in the nature of the pain, which passes from an acute and pulsating, to a dull or heavy character; and sometimes by chills or chilliness, slight rigours, and a general perspiration. The difficulty of swallowing continues or increases; and, upon introducing the finger, a softness, or even fluctuation of one or both tonsils may be felt. When the parts can be brought into view, the part to which the matter points may sometimes be seen. The spontaneous rupture of the abscess, when it is not opened immediately upon ascertaining the presence of matter, occurs either when retching or vomiting, or when coughing or speaking, or when attempting to swallow or to throw out the secretions from the throat. But the abscess may break during sleep, the matter having been insensibly swallowed, and the patient feeling greatly relieved when awakened. If the abscess thus breaks spontaneously, the matter is usually fetid and offensive from its retention, the fetor sometimes being the only indication of the rupture, when the quantity of matter is small and mixed with the secretions from the throat and mouth. Instances are rare in which the matter makes its way externally, or at the lateral and upper region of the neck; but it has thus made its way either in one or in both sides, especially when a diffusive inflammation of the adjoining cellular tissue has occurred in connexion with the suppuration of the tonsils, particularly in the more malignant exanthematous complications of the disease; and in still rarer cases, the matter has found its way along the vessels of the neck, into the chest.

[It is doubtful whether *melanosis* ever attacks this organ, as Prof. GROSS states that there is not a single instance of it on record.

Dr. WARREN, of Boston, regards true *scirrhus* of the tonsils as not infrequent (*on Tumours*, p. 356), although most pathologists regard it as of extremely rare occurrence, and believe that it is confounded with mere *induration*. Such is most probably the case.

DUPUYTREN describes a case where he met with an *acephalocyst* in an excised tonsil, the pouch being of a white opaline tint, elastic, and occupied with a limpid, serous fluid, without, however, the ordinary globular hydatid. The tonsil was greatly enlarged. It has been suggested that, as this appearance has not been observed by others, it may have been owing to obstruction and consequent dilatation of one or more of the follicles.

We sometimes observe *concretions of a purely animal* character, blocking up the lacunæ of the tonsils and distending them, of a whitish, grayish, or yellowish tint, unctuous or greasy to the touch, very fetid, and varying in size. They are composed apparently of fibrin, in union with mucus.]

9. Inflammation of both tonsils sometimes terminates differently as respects each; one terminating by resolution, the other by suppuration. Gangrene takes place rarely, and only in the malignant and complicated states of the malady. The termination of tonsillitis in *chronic enlargement* of the parts is not infrequent in scrofulous and cachectic subjects, and after repeated or periodic attacks. These returns of the disease may be more or less frequent; or at certain seasons, or at uncertain times. They may recur, and leave the tonsils either in a healthy state, or more or less enlarged, the enlargement increasing and becoming more permanent after each attack. This is frequently the case after a recurrence of the complaint, the previous affection, or an existing enlargement predisposing to subsequent attacks, so that the disease assumes the character of a remittent chronic tonsillitis. This is most apt to occur in the scrofulous diathesis, and in young persons of delicate constitution and weak digestive functions. In these more especially the enlargement may become permanent and more or less embarrass deglutition, and affect the voice and speech.*

10. *D. Enlargement of the tonsils* commonly proceeds from changes which are purely inflammatory or the consequences of inflammation, although *other* changes also produce it in rarer instances, as is shown by the examination of cases, in which a fatal result has followed some other intercurrent or complicating disease. The appearances which proceed more strictly from inflammation, are thickening and injection of the membrane enveloping the tonsils; infiltration of a gelatinous and yellowish serum giving rise to thickening, enlargement, and induration in the cellular tissue situated between the follicles which constitute these organs, and purulent infiltrations or collections in the same situation. The parietes of the follicles are also sometimes thickened and indurated or softened. In those cases which are still more chronic and appear independently of inflammation, or in which inflammatory action is either doubtful or has long subsided, concrete friable matter, very closely resembling tubercular matter, is found in one or several of the lacunæ of the tonsils. When it is found in one cavity, the collection may be more or less considerable, and may have formed either in a single lacuna or in several, the partitions between them becoming absorbed, and a single cavity being thus formed.

[*Hypertrophy of the tonsils* is the usual result of chronic inflammation, inducing an enlargement of the organs in all directions, which are of a firm, almost fibro-cartilaginous consistence, while the surface is of a pale reddish or cineritious hue, and the mucous follicles often five or six times the natural size. The orifices of these follicles may be closed with inspissated mucus, earthy concretions, fibrinous plugs, or tubercular matter. The tonsils, however, may be remarkably friable and distinctly lobulated, instead of being

* [Dr. STOKES maintains that tonsillitis is not only a frequent cause of persistent cough in children, but also of *posterior spinal curvature*. The continued cough tends to draw up the shoulders and throw the head forward, thus causing a strain upon the walls of the chest which extend to the spine. The patient becomes round-shouldered, stoops, and after a while posterior curvature of the dorsal vertebræ takes place. Hence the importance of attending to chronic tonsillary enlargement, especially in children of a lymphatic temperament; and not only local means must be employed, but such, also, as are calculated to strengthen the general system.]

tough and indurated, and of a red, brownish, or violet colour. When the hypertrophy is great, the speech, hearing, and respiration are apt to be affected, while, at the same time, the chest is rounded and arched behind, contracted in front, and flattened at the sides, while the neck is bent forward, and the patient habitually stoops. The breathing is more or less embarrassed—during sleep greatly so—the head being thrown back so as to bring the mouth on a line with the larynx, and the surface bathed in perspiration, from the increased effort of the respiratory muscles to introduce air into the lungs. In one instance, a boy of ten years of age, where the uvula as well as tonsils were enormously enlarged, violent paroxysms of suffocation would frequently occur during the night, owing to the enlarged and elongated uvula falling into the rima glottidis, thus completely preventing the entrance of air into the lungs. The patient was anæmied and greatly emaciated, but on excising the enlarged organs no more paroxysms occurred, and in a short time he was restored to his usual health. We are inclined to believe that this disease rarely, if ever, occurs except in persons of a scrofulous constitution.

Rokitansky says, "In scrofulous subjects the tonsils are often affected, in addition to hypertrophy and habitual hyperæmia, with a peculiar blenorrhœa, and the purulent secretion not infrequently becomes inspissated, so as to form tubercular cheesy plugs, or even chalky concretions. These, in their turn, keep up a perpetual state of irritation in the tonsils." And this affection, we may remark, is often not amenable to local treatment, as the nitrate of silver, but only yields to excision of the diseased follicles.

On examining with a microscope the structure of enlarged tonsils which have been removed, we find it identical, in most cases, with that of the healthy gland, constituting a true hypertrophy. It is to be recollected that the tonsils are made up of a number of duplicatures and involutions of the mucous membrane; a vertical section showing the thin surface-layer of scaly epithelium with a thick underlying stratum, consisting of nuclear, or very slightly developed celloid particles; this layer, being traversed by vessels which are dilated in hypertrophied specimens, running up to the basement-membrane, which supports the layer of scaly epithelium. When there is any habitual hyperæmia, and consequent exudation, this low sub-mucous celloid growth readily assimilates the effused plasma into similar substance, and so the hypertrophy continually goes on. The *induration* which takes place, and which is often mistaken for scirrhus, is doubtless owing to a fibroid development of the exudation.

Gangrene of the tonsils sometimes occurs as the result of acute tonsillitis, and is readily ascertained by the livid colour of the parts, the fetid breath, and the dark, sanious discharge. After death, the tonsils are found pulpy and disorganized, and of a deep ash or mahogany hue. In scarlatina maligna, or putrid sore throat, as this form of disease is often called, deep ulceration, gangrene, and sloughing of these organs is a common phenomenon. The changes which the tonsils undergo in *syphilitic* affections will be found particularly described under the articles Syphilis and Venereal Affections.

These organs may be the seat of some of the *heterologous* formations, as the *tubercular*, which is by no means rare, the matter being of a pale yellowish colour, semi-concrete, and in small isolated particles, or masses of a considerable size. This matter may undergo softening or be changed into chalky concretions, and is often associated with tubercular deposits in other structures.

Encephaloid of the tonsils has been observed by Velpeau, Vidal, Carswell, though it is very rare. It may occur as an infiltration, or a tumour, or in disseminated masses, and indicates a similar deposit in other organs.]

11. II. Inflammation of the Pharynx.—Syn.—*Pharyngitis* (from φάρυγξ, the posterior part of the throat); *Cynanche Pharyngæa; Angina Pharyngæa; Dysphagia Inflammatoria*, Auct. *Angine Pharyngée*, Fr. *Schlundentzündung*, Germ.

Classif.—III. Class, I. Order (*Author*).

12. Definit.—*Soreness or pain referred chiefly to the posterior portion of the throat, with increased pain and difficulty when swallowing, the substances taken being sometimes forcibly ejected through the nostrils; constitutional disturbance often slight, but oftener very severe or dangerous.*

13. *Pharyngitis* occurs in a great variety of forms, circumstances, and complication. It may be *mild, slight, catarrhal, primary, consecutive;* and *associated* with other disorders or maladies. It may exist *singly* or simply, or be *associated* with inflammatory action more or less manifest or pronounced, in either the soft palate or fauces, or in the tonsils, or even in the œsophagus, or in the larynx and epiglottis. The simple or unassociated state of the disease is much less frequent than the associations now mentioned, and of these the most common are those in which the soft palate and tonsils are more or less prominently affected. Pharyngitis in its simpler states is often symptomatic of disorder of the digestive functions, especially of severe or protracted indigestion; or of the more acute states of dyspepsia following an excessive indulgence in rich food and vinous or spirituous liquors; the eructations of irritating gases and fluids from the stomach in these cases inducing irritation and inflammation of the pharynx. Pharyngitis in its associated states presents every grade of severity, and all the forms or characters which are observed in diseases usually denominated inflammatory. It may be thus *sthenic* or phlogistic, either when simple, or when associated with tonsillitis or palatitis; or *asthenic* or *malignant*, when it occurs in the course of low fevers, during disorders of the digestive functions, during morbid states of the blood or general cachexia, and more especially in connexion with scarlet fevers or with any of the other exanthemata. When thus asthenic or associated the inflammatory action always is extended to the adjoining parts of the throat, not infrequently to both the œsophagus and larynx, and even along the Eustachian tubes to the ears.

14. i. *Causes.*—Pharyngitis, in its simple and primary form, is rarely observed; but associated as now stated, or even appearing as the more prominent part of an inflammation extending to adjoining portions of the throat, or even farther, it is of frequent occurrence; and owing to the functions of these parts, and even of others in the vicinity, it is of much greater importance than has hitherto been attached to it. The most common manifestation of the disease is the *catarrhal;* and although it may be the chief affection, it is when thus characterized generally associated in

the manner just stated. When pharyngitis is *mild* or *catarrhal*, it usually proceeds from exposure to cold in some form or manner (§ 4). When more or less limited, it is frequently consecutive of acute attacks of indigestion, caused by the ingurgitation of too much food or fermented liquors; or it is more directly produced by swallowing acrid, corrosive, or irritating substances, [or smoking tobacco.] Thus it may be caused by hot water; by acrid poisons, taken intentionally or by mistake; by mustard, given as an emetic in cases of narcotic poisoning; and by hot spices, or irritant medicines exhibited in excessive doses. In those circumstances, although the pharynx may be chiefly affected, the soft palate and œsophagus may be more or less implicated with other adjoining parts. *Catarrhal* pharyngitis generally proceeds from the same causes as those which produce tonsillitis, especially from currents of cold air passing over or near the neck or throat, from wet feet or damp clothes, from cold and wet seasons, and from changeable weather, especially about the equinoxes, when it is often epidemic. The more severe and dangerous forms of pharyngitis are those in which this local affection is merely a prominent manifestation of a constitutional or febrile malady, as in scarlet fever, small-pox, measles, scurvy, erysipelas, and other diseases in which the circulating fluids become more or less contaminated. In these circumstances the pharyngitis is asthenic, often characterized by pellicular exudations, but frequently not so characterized; always spreading, and generally, when thus symptomatic, occurring from infection, and often as an epidemic.

15. ii. *Description.*—Pharyngitis may be an extension of a catarrhal or mild inflammation from the fauces or tonsils, or from both; or it may be coeval as well as coextensive with these; or it may be associated with *œsophagitis* (see *art.* ŒSOPHAGUS), either as the primary or the secondary affection. The catarrhal form usually commences with coryza and all the symptoms of a common cold or catarrh, or with those mentioned above in connexion with *tonsillitis* (§ 5).—*A.* The more acute or phlogistic form, especially when occurring in the sanguine temperament and in young robust persons, is commonly attended by symptomatic inflammatory fever ushered in by chills or rigours. With these a sense of heat, dryness, and soreness is felt at the posterior part of the throat and posterior nares, and the surface of the pharynx is seen, when the tongue is depressed, red, and injected, sometimes shining. Soreness and pain are increased by attempts at deglutition, or as soon as the pharyngeal muscles are called into action. As the affection proceeds, the pain and difficulty of swallowing increase, and substances, especially fluids, are often forcibly rejected by the nostrils. When the inflammation is severe, the pain is often referred chiefly to the neck or the anterior aspect of the upper cervical vertebræ. The heat and pain in this situation are somewhat abated as soon as the red and inflamed surface becomes covered in parts with a thick tenacious mucous exudation. This exudation often increases, or is more and more abundant, but still viscid or ropy, and is discharged after a hacking, or hawking, or guttural cough; yet the disease may continue several days, or even proceed to its termination, without this secretion being very manifest or considerable. If the inflammation extends to the epiglottis and larynx, the cough is more severe, paroxysmal, or strangulating than when it is confined to the posterior part of the pharynx.

16. When the *lower portion* of the pharynx is chiefly affected, then the soreness and pain are referred chiefly to the superior part of the throat, behind the cartilages, and the increased pain on swallowing, and the difficulty of accomplishing this act, are experienced after substances have been seized by the pharyngeal muscles and are about to pass into the œsophagus, at the top of which they are felt to be arrested or to pass with difficulty. In these cases the inflammatory action often extends more or less down the œsophagus; the soreness and pain being increased upon pressing the lateral parts of the neck and throat. In these cases the posterior part of the pharynx may not present a very marked state of inflammation, even when the root of the tongue is pressed downward; the inflammation being often either lower down than this, or affecting chiefly the anterior parietes of the pharynx. The voice is generally but little, or not at all affected; and the cough varies in severity and in character with the degree in which the epiglottis and larynx are implicated.

Whatever may be the exact seat and extent of the pharyngeal affection, the constitutional disturbance is very various, being in some inflammatory or sthenic, in others asthenic, and in many slight or very mild. The severity of the accompanying fever depends much upon temperament, diathesis, habit of body, and the age of the patient. It is more generally asthenic or adynamic in the spreading and other states of the disease about to be noticed, in cachectic conditions of the frame, and when the affection is a prominent complication of other febrile and exanthematous maladies. Pharyngitis presents certain characters or forms which deserve notice.

17. *B.* The *catarrhal* is generally erythematic or superficial, and extends more or less, with an abundant secretion, to the posterior nares, the fauces, and the tonsils. It often commences with coryza, and presents a marked tendency to extend to the larynx and trachea, and to be followed by pulmonary catarrh, or by bronchitis—especially during cold and wet seasons, and in changeable weather, or during easterly winds. In rare instances pharyngitis presents a distinctly *gouty* or a *rheumatic character*. Of these two forms the *gouty* is the more frequent, and is generally consequent upon attacks of indigestion, often connected with exposures to cold or wet, occurring in the gouty diathesis. The *rheumatic* is seldom observed, unless in connexion with rheumatism of the face or neck, and with biliary accumulations and disorder of the digestive organs. The association of pharyngitis with *erysipelas* is much more frequent than is supposed; but this, with other states and *complications* of the disease, will be more fully considered in the sequel.

18. *C.* The *terminations* of pharyngitis are chiefly by *resolution*, by *suppuration*, and by *gangrene.*—*a. Resolution* is the common issue in the catarrhal form, the superficial nature of the affection, and the abundance of the secretion from the surface, favouring this termination, which usually occurs in a few days, and is rarely prolonged beyond the fourteenth day. In most cases the inflammation is superficial, or erythematous; but in others the sub-mucous cellular tissue is also af-

fected, and the symptoms assume a greater degree of severity, the surface remaining longer red and dry, or subsequently becoming covered by a viscid secretion, which is detached only after great efforts and paroxysms of cough, sometimes attended by retchings.—*b. Suppuration* occurs in rare cases of pharyngitis, owing to the extension of inflammation to a portion of the cellular tissue connecting the pharynx to adjoining parts. This termination is usually announced by irregular chills or rigours, by a pulsating pain or sensation in the part chiefly affected, and sometimes by sweats. The matter is most frequently formed at the posterior portion of the pharynx, or at the sides, or even anteriorly. In all cases the abscess renders deglutition difficult or almost impossible; and in the latter situations it embarrasses respiration, and affects the voice and speech. The abscess may break spontaneously; but if it be not opened early, or when it cannot be reached, the matter may accumulate to a fatal extent, owing to its pressure on the larynx, or it may become offensive and contaminating, or it may find its way externally at the side of the neck, or it may break into the trachea, especially when it forms in the anterior or lateral parts of the pharynx.—*c. Post-pharyngeal-abscess* is a rare result of pharyngitis; and although it generally opens into the pharynx, it may follow the course just now stated; and it may, moreover, produce disease — inflammation, caries, &c., of one or more of the cervical vertebræ. This issue is most likely to occur in the complicated pharyngitis of exanthematous fevers, especially scarlatina, in which I have met with two instances.—*Gangrene* very rarely occurs in simple pharyngitis; but it is not an infrequent termination of the severe and complicated forms about to be noticed.

[The pharynx may be the seat of *scirrhus, tubercle*, or *encephaloid*. The latter is not unfreqently met with, and may cause death by mechanical obstructions. Mayo records such a case, where a scirrhous tumour was attached to the laryngeal surface of the pharynx, which gradually filled the passage, and destroyed the patient by inanition. A similar case has been recorded by Dr. John Watson, of N. Y. (*Am. Journ. Med. Sci.*). Occasionally *polypous* growths have been observed in this situation, as in a case described by Professor Monro, of Edinburgh, where the polypus adhered to the fore part of the pharynx by a narrow root, and was of such a length as to be thrown forward against the incisor teeth whenever the patient retched. We have known one instance where the pharynx became *sacculated* at its junction with the œsophagus, forming a blind pouch. A sac has been found in this situation large enough to hold several ounces, and entrapping articles of food in their descent to the stomach.]

19. *D. Chronic Pharyngitis.* — The mild or slight state of the disease, as well as that which is more severe, although generally terminating in resolution in a few days, sometimes becomes *chronic*, or relapses so frequently, or returns after intervals, and thus assumes first a remittent or intermittent form, and then ultimately becomes more continued and chronic. In this state of the disease, difficulty of swallowing, uneasiness, soreness, slight pain in the posterior part of the throat, relaxation of the uvula, sometimes hoarseness of voice and speech, hacking cough, and either dryness of the throat or increased secretion from the pharynx, or an alternation of dryness and augmented secretion, are the usual symptoms; and these commonly continue for a long period, with remissions and exacerbations, especially in persons suffering from, or subject to chronic inflammatory dyspepsia, or chronic bronchitis, or tubercular consumption. In some such cases, the chronic affection is readily excited to an *acute* or *sub-acute form*, by errors in diet, by cold or damp feet, by currents of air, or by any of the usual exciting causes.

20. III. Inflammation of the Throat with plastic Exudation.—Synon.—*Plastic Inflammation of the Throat; Pseudo-membraneous Inflammation of the Throat; Angina Membranacea; Diphtheritis*, Bretonneau. *Angina Plastica; Angine Diphthéritique; A. Couenneuse; A. Pseudo-Membraneuse*, Auct. Gall. *Angina with pellicular exudation.*

Classif.—As above.

21. Definit.—*Soreness, pain and heat in the throat, often increased on deglutition; redness with an exudation of a buff or grey-coloured lymph in spots or patches, at an early stage; commencing in either the fauces, or the tonsils, or pharynx, and quickly extending to these, and often also to the larynx and œsophagus; the exudation becoming more continuous and firm, accompanied with fever, and appearing generally either epidemically or endemically.*

22. This disease has been confounded with *Croup*, on the one hand; with malignant angina or putrid sore throat, or *Cynanche maligna*, on the other. It is rarely seen sporadically, or in isolated instances; but chiefly in an endemic or epidemic form, owing to locality, season, weather, and exposure; and, even in these circumstances, the usual causes of inflammations of the throat have been concerned in producing it; more especially vicissitudes of weather, changes of season, cold and humid states of the air; low, miasmatous, and wet localities. It is most prevalent in children after weaning, and up to puberty; and it becomes less and less frequent with the progress of age. As this form of inflammation of the throat occurs endemically or epidemically, it has been viewed by some writers as infectious. The prevalence of it may, however, be assigned to local or more general causes, especially those just now mentioned. But as it is attended by much fetor of the breath, the emanations from the affected surface occasioning this fetor may infect the throats of young and susceptible subjects, especially when sleeping with, or inhaling the breath of those already attacked. It may thus extend to all or the great number of the children in a family, when one is affected.

23. i. *Description.*—The *symptoms* of plastic inflammation of the throat vary much at their commencement; in some cases beginning and advancing insidiously, in others more manifestly and severely. In many it occurs with all or most of the symptoms of a common catarrh or sore throat, either with or without chills or rigours. Generally slight soreness and pain are first experienced, with a sense of increased heat, and are increased on swallowing. Redness, of different grades, is seen in the soft palate, or its pillars or tonsils, and the uvula is relaxed. The inflammation sometimes commences in the posterior nares and extends to the pharynx, tonsils, &c.; but it more frequently begins in the tonsils and isthmus faucium, and extends to the pharynx, larynx, &c. Thus far the local symptoms are not different from

those of common sore throat; but the constitutional disturbance is frequently more severe; nausea, vomiting, heat of skin, thirst, loss of appetite, and great acceleration of pulse being most frequently observed.

24. *A.* The *special* characters of the disease now supervene with greater or less rapidity. The tonsils, the velum palati, the pharynx, either successively or at the same time, present irregular patches of a yellowish, buff, or grayish-coloured exudation on the inflamed surface. These patches enlarge, coalesce, and extend to the nasal fossæ, or to the larynx with the usual symptoms of primary *croup* (see that *art.*, § 32, *et seq.*), and often also to the œsophagus. In adults, the disease often commences in the nasal fossæ and extends to the pharynx. At the commencement of the fibrinous exudation, stiffness, soreness, and pain are experienced in the neck and throat. The face is pallid, sometimes red and swollen; the tonsils and the cervical and sub-maxillary glands are enlarged; and the neck is often also somewhat tumified. Deglutition becomes more difficult as the morbid exudation advances; and substances are frequently forcibly ejected through the mouth and nostrils, when attempting to swallow. On some occasions, when the disease has been epidemic, the parotid as well as sub-maxillary glands have been enlarged; and the membraneous exudation has in a few hours extended over all parts of the throat, and occasionally over the cheeks and tongue. In some cases the morbid exudation has even appeared on the lips, in the nostrils, and behind the ears. With the development of the exudation the mucous surface, at its margin, is red and swollen. The patches become elevated, or partially detached in parts; and minute exudations of blood take place, which mix with a more or less abundant salivary discharge. The secretion in the mouth and throat is sometimes thick, viscid, frothy, and of a grayish or yellowish gray tint. In these cases it is often scanty and discharged with considerable difficulty. But in other instances, especially when the disease is very prevalent, the secretion from the throat is much more abundant, frequently serous, sanious, or sanguinolent, and always nauseous and fetid. In the more severe and asthenic cases these characters are very marked; and a similar discharge escapes from the nostrils, epistaxis sometimes also taking place. As the disease advances, the pellicular exudation becomes detached in parts, and is discharged with the saliva and morbid secretion. Very frequently the exudation is formed anew, on the surface from which a portion had been detached; and this reproduction of it may take place in the course of a few hours, and even for the third time, each successive exudation being more scanty or thin. The disease may continue in this state from eight to twelve days, the exfoliation of the pellicular exudation going on the greater part of the time. But sometimes the exudation softens, or breaks down, in the course of three or four days, or even in a shorter time mingles with the more fluid discharge from the inflamed surface, and is thus discharged, without presenting a continuous or membraneous form. M. Guersent states that, when the exudation is only slight or partial, it is sometimes absorbed as the disease subsides, and is not thrown off. With the resolution of the affection of the throat, the swelling of the neck and of the glands and the painful symptoms subside.

25. *B.* The *constitutional symptoms* vary much with the vital energy of the patient, with the predisposing, endemic, and exciting causes, and with the character of the prevailing epidemic. In some cases, the disease presents a *sthenic*, or phlogistic, or sthenically inflammatory condition; in others, it is *asthenic*, or putro-adynamic, or intermediate between these extremes. The *former* occurs most commonly in sporadic cases, in strong or robust subjects, and in the well-fed, plethoric, and sanguine. In these the attending fever is inflammatory; the face is red or flushed; the pulse frequent, full, and strong; and the skin dry and hot. There are thirst, scanty urine, and costive bowels. The local symptoms are generally severe, and the membraneous exudation is firm and continuous, and rapidly and largely developed. The *latter* appears chiefly in cachectic, weak, or delicate or ill-fed subjects; in low, close, and miasmatous localities; in over-crowded or ill-ventilated apartments, &c., and in epidemic visitations of the malady. In these circumstances the face is tumid, or bloated, or pale; the neck is swollen; the flesh soft or flabby; the pulse is quick, soft, small, or weak; the skin hot; and the excretions offensive, scanty, or irregular. The discharge from the mouth is serous or sanious, and extremely offensive; a similar discharge often taking place from the nostrils. In these the exudation is much less consistent, sometimes pultaceous, more readily breaks down and mingles with a more offensive and a more abundant discharge from the throat, than is observed in the sthenic forms of the malady.

26. *C.* A *less acute*, or a *sub-acute variety*—a milder form of the disease—is sometimes seen, in which the local and constitutional symptoms are less severe, less rapid in their development, and more insidious at their invasion and in their early progress, than in the forms just described. In this the affection of the throat is either more confined to one part, or is attended by much less exudation and fluid secretion. The pain and difficulty of swallowing are not considerable, and the swelling of the neck and glands not very remarkable. The febrile symptoms are often slight, although the debility is frequently great. The symptoms of the disease, both local and constitutional, thus vary remarkably, according to the extrinsic and intrinsic circumstances of individual cases, and to the intensity of the causes, from the most mild to the most acutely and rapidly phlogistic, on the one hand, to the most putro-adynamic on the other.

27. *D. Termination and Prognosis.*—The pellicular forms of inflammation of the throat are all more or less dangerous. But the danger arises chiefly from the frequency of the extension of the inflammation to the larynx; a contingency which may occur in the most severe cases, even in a few hours, after the full manifestation of the malady, and which is more frequent in some epidemics and seasons, than in others. In many instances, the extension of the disease to the larynx, as described in the *art.* Croup (see § 12, *et seq.*), is the earliest indication of the nature and danger of the affection; the antecedent symptoms having been overlooked, owing to their mildness, or the very early age of the patient. The disease is most frequently fatal in these cases; and when it attacks delicate or badly nourished children, or those weakened by previous diseases. It is less dangerous in adults, unless the constitution has

become cachectic or debilitated, or injured by dissipation, or the blood contaminated by neglect of the depurating functions. In these cases, the morbid process may advance not only to the larynx, but also to the trachea and bronchi, and even to the pharynx and œsophagus. The intense state of the disease may *terminate* in twenty-four hours, when the larynx is implicated, but more frequently from the 3d to the 7th day. The less violent attacks may be prolonged until the 14th, or even the 21st day; but seldom beyond the latter period. The disease very rarely assumes a chronic form.

28. The termination of the disease by *resolution* is attended by detachment of the pellicular exudation, either spontaneously or by the aid of treatment. It most frequently occurs from the 7th to the 21st day; but it is often hastened even before the former period by local treatment. The grayish or brownish flakes of exudation, when detached, leave the mucous surface of the gutturo-maxillary fossa of a uniform red or rose colour, and covered in parts by a puriform mucus. The tonsils are often enlarged, or sometimes contain a small collection of matter. In some places, erosions appear, especially where the exudation was longest and most firmly attached; but these are either very superficial or illusory.

29. When the affection implicates the *larynx*, the patient is seized with a short, dry, sibillous, or wheezing cough, which recurs frequently in short paroxysms; and is soon followed by aphonia, and a sense of impending suffocation (see *arts.* Croup, § 12, *et seq.*, and Larynx, § 55, *et seq.*). In children and infants, asphyxia with convulsions may rapidly terminate life; but, in adults, the disease more frequently is either arrested, or it extends along the trachea, the exudation becoming more fluid or less consistent, and assuming the appearance at first of a viscid mucus. It thus often advances to the bronchi on both sides, and sometimes terminates in *bronchitis* or *broncho-pneumonia.*

30. *E. The appearances after death* vary with the period of the disease at which dissolution occurred, and the states of vital power and of vascular contamination. If death have occurred at an early period, owing to the extension of the pellicular exudation to the larynx, the mucous surface and sub-mucous cellular tissue are more or less injected, the epithelium of the former being covered by a membraneous exudation in more or less extensive patches. With the extension and *sthenic* character of the inflammation, the exudation is generally continuous, and is either firmly attached or partially detached, according to the duration of the disease. In the more *asthenic* cases, the exudation is more soft, pulpy, or broken down or mingled with a sanious or dirty mucus; the mucous and sub-mucous tissues being dark, livid, congested, sometimes ecchymosed or infiltrated with serum or blood, or with both, and often as if excoriated; the mucous surface being in numerous parts or spots deprived of epithelium, and eroded. These tissues are sometimes brown, livid, or of a dark gray colour, softened or friable, and emit a fetid odour. The cervical and sub-maxillary glands are much enlarged, of a brownish or violet red hue, softened, especially in their centres, and sometimes reduced to a pulpy or semi-fluid state, or to a sanious appearance nearly resembling wine-lees. The changes in this class of cases are very nearly the same as those observed in the more malignant cases of the scarlatinous cynanche, and described in the article on Scarlet Fever (see § 20, *et seq.*). The lesions found in the *larynx* and *bronchi* are similar to those described when treating of inflammation of these passages, and in the Croup.

31. IV. Diffusive Inflammation of the Throat. —Syn.—*Erysipelatous Cynanche. Diffusive Angina. Asthenic Angina. Simple and complicated Cynanche. Cynanche* vel *Angina simplex et associata.* [*Putrid, ulcerated, or gangrenous Sore Throat: Angina maligna.*]

Classif.—As above.

Definit.—*Soreness or pain, with redness of the throat, increased on deglutition, accompanied with fever, and often with a diffused swelling, more or less evinced internally and externally: the constitutional affection presenting more of the asthenic than of sthenic characters.*

32. *A. Causes.*—This form of *angina* or *cynanche* is often general, or diffused, when it comes under the observation of the physician; or it may commence in the arch or pillars of the palate, or in the posterior nares, or in the tonsils, or in the pharynx, and rapidly extend from either part to the others. It may be strictly erysipelatous, or be consecutive of erysipelas of the face; and I have seen instances of its occurrence from the inhalation of the breath of patients dangerously affected with erysipelas and puerperal fever. I have most frequently met with it in persons who have been previously attacked with scarlatinous sore throat in a very severe form, or who have been exposed to cold in some way while the digestive organs have been disordered, or the depurating functions impeded or interrupted; or who are living in low and close or ill-ventilated apartments, in over-crowded sleeping-rooms, or in houses the air of which is contaminated by foul privies, drains, or cess-pools, in which latter circumstances especially it often attacks several, or many persons, particularly the younger, in the same family, the delicate, ill-fed, or convalescent from other diseases, or others similarly predisposed. In these circumstances, it may be viewed as a primary or simple malady; but although it may appear as a primary, it is not a simple affection, but rather the more prominent manifestation of what is really a constitutional malady, organic nervous power and the vascular system and blood being more or less impressed and disordered. When thus apparently simple or primary, it may be either mild, or severe, or malignant, as well as when it is consecutive of erysipelas, or of scarlatina, or of small-pox, &c. In these latter or associated states, the cynanche may be said to be specific; and the specific forms may not be limited to the several *exanthematous fevers*, but extended to the *mercurial*, in which the tongue, gums, and salivary apparatus are particularly implicated, as described when treating of the mercurial poisons (see § 568, *et seq.*), and to the *syphilitic*, as shown in the article on Venereal Diseases.

33. The infectious nature of the diffusive form of cynanche, as well as of that next to be noticed, has been affirmed by some writers, and disputed by others. This difference of opinion is chiefly owing to the circumstances under which both the one form and the other generally appear. The local causes most frequently originating diffusive cynanche independently of the scarlatinous infection are such as often affect a greater or less

number in one house or family; but instances have occurred of a person having transmitted the disease to others differently circumstanced as respects these causes; although it has rarely proceeded to a third series of subjects, unless the predisposing and existing causes were present, due ventilation and dilution of the contaminating emanation preventing infection. This form of cynanche, moreover, is very frequently a form merely of scarlet fever, the cutaneous affection being either wanting or overlooked; the spread of the disease being attributable rather to the fever than to the state of the throat. But when, in simple diffusive cynanche, the disease is severe or malignant, or is attended by any degree of fetor, the risk of infection should be dreaded, and the unaffected ought to avoid the inhalation of the breath of the affected; for I have seen this form of cynanche thus communicated when there was not the least evidence of a scarlatinous origin having been connected with it. This form of angina, moreover, may be caused by suppression of the catamenia; and it is not unfrequently favoured by, and complicated with, the gouty diathesis, and by biliary disorder.

34. *B. Symptoms.*—These vary with the causes, with their intensity or concentration, with the season, weather, and endemic or epidemic influences, with the predisposition and with pre-existing disorder. This affection may be slight, as in most cases of the catarrhal form. It is generally more severe in the morbillous or variolous states; and it is often most severe or even malignant or gangrenous in the scarlatinous and erysipelatous. Diffusive cynanche may be either mild or severe—also in the simple or uncomplicated states, or when it occurs independently of exanthematous infection, and is produced sporadically or endemically from the contaminating or poisonous causes already mentioned (§ 32, 33). It is, however, in the more complicated states, especially in the erysipelatous and scarlatinous, that the adjoining cellular tissues and glands are most liable to be infiltrated, contaminated, and softened; the organic nervous power to be depressed, and the circulating fluids to be altered. Generally in proportion to the severity of the local affection—to the diffusion of the inflammation—to the swelling, lividity, pain, heat, and difficulty of swallowing, and to the fetor of the breath, are the febrile symptoms developed; the pulse being quick or rapid, the heat of surface increased, and the secretions and excretions impaired, suppressed, or interrupted. But the defect of organic nervous or vital power is more especially manifested by the softness, openness, smallness, and the great rapidity, or the unusual slowness of the pulse; these varying states of pulse depending upon the quantity and quality of the blood, as well as upon deficient organic nervous power. With the lividity of the inflamed throat, with its diffusion to the pharynx and œsophagus, or even to the respiratory passages, on the one hand, and to the mouth and cheeks, Eustachian tube and internal ears, on the other, and with the swelling of the more external parts, the febrile symptoms generally present more and more of an asthenic character; and the blood more of an impure, imperfectly oxygenated, contaminated, or poisoned condition—a condition varying according to the nature and concentration of the exciting causes, and to the extent of impaired or interrupted depuration. In this advanced stage and low form of the malady, the excretions become fetid, especially those from the bowels; the fetor of the breath is remarkable, and the urine scanty, high-coloured, and turbid. Sometimes diarrhœa supervenes and becomes critical, recovery either afterward taking place, or fatal exhaustion being produced by it, accordingly as it is treated, or as the constitutional powers resist its effects.

35. *C.* The *Duration* of this general diffusive form of cynanche is very various. If the respiratory passages become early affected, or if the disease assumes a very severe form, a fatal result may occur in the course of two or three days from the commencement of the attack; but this seldom takes place before the 5th or 6th day; and occasionally it occurs at even a much later period, owing either to vital exhaustion, to contamination of the blood as stated above (§ 34), to lesion of the respiratory passages and organs, or to changes in the nervous centres and their membranes. Recovery generally occurs from the 7th to the 14th day, but sometimes much later. *Relapses*, or *repeated attacks*, of the disease may take place; the intervals between them varying with the circumstances or causes producing them; and the malady may even, from these and other causes, thus assume somewhat of a *remittent* or *intermittent form*, or even become *chronic*, recovery or a more accute attack supervening after an indefinite period.

36. *D. Terminations and Prognosis.*—*Recovery* often follows early and decided treatment; the inflammation of the throat presenting a less livid hue, the swelling subsiding, and deglutition becoming more easy. When these changes are attended by an improvement in the states of the pulse and skin, and in the several secretions and excretions, then this result may be expected with certainty. More unfavourable symptoms even than those already mentioned sometimes appear, and indicate irritation of the nervous centres, either by the contaminating operation of the miasms causing the disease, or by the interruption of the depurating functions; the blood in either case being affected, and vital power depressed. These symptoms are convulsions in children; delirium and restlessness in young persons and adults; followed by stupor, coma, pickings of the bedclothes, &c. These generally follow rapidly upon the extension of the inflammation, or rather of the local morbid action to the œsophagus, to the larynx, and trachea, or to the Eustachian tubes and internal cavities of the ears. The severity of the local symptoms, the diffused swelling produced by the infiltration of the sub-mucous cellular tissue, as well as by capillary injection and congestion, and the viscid exudation from the diseased surface, increase all the symptoms connected with deglutition and respiration, and often threaten, and sometimes occasion, death by asphyxia, especially in children and young subjects, convulsions often also accompanying this event. The danger is generally great in proportion to the difficulty of respiration, to the dark hue and swelling of the throat, to the fetor of the breath, to the tumefaction of the sub-maxiliary regions and neck, and to the weakness, smallness, and frequency of the pulse. Lividity of the face, lips, and tongue; a dirty, dark hue of the general surface, and blueness of the fingers and nails, are commonly fatal signs. Suppression of urine, and involuntary or unconscious intestinal evacuations, are also indications of impending

dissolution, especially when they are preceded or attended by the foregoing symptoms.

37. The dark colour of the throat, the sanious discharge from the mouth, and the gangrenous or fetid odour of the breath, have induced a belief, especially among some writers of the last century, that *gangrene* or sphacelation of one or more of the parts affected supervenes and occasions death. But actual sphacelation of any of these parts rarely occurs during the life of the patient; although the swelling, sanious or sero-sanious infiltration, and softening of the parts, are sometimes initiative of this alteration, and approach it more or less soon after dissolution. In the rare cases in which sphacelation of a portion of the inflamed surface takes place, a slough usually sufficiently apparent is formed, and, if the treatment be active and judicious, it is thrown off, leaving an ulcerated cavity or loss of substance more or less manifest according to the amount of the disease. In these cases, the danger may be less (recovery sometimes occurring) than when the morbid action is more diffused; the constitutional symptoms, or those connected with the nervous and vascular systems, and with the state of the blood and of the excretions, evincing by their severity a greater amount of risk than is denoted by the local sphacelation. This alteration, instead of constituting a distinct variety of cynanche, is merely an accident, or result seldom supervening, and is as likely to occur in one form of the disease as in another, although it is consequent upon the severity of the local affection, whether that affection be simple, or complicated with scarlatina or scurvy, or any other constitutional malady. The *phagedenic* or gangrenous stomatitis, affecting in rare instances infants and young children (see *art.* Stomatitis, § 24, *et seq.*), sometimes extends to the fauces and throat, if it be not quickly arrested, and the poisonous action of mercurials, particularly in this class of subjects, and in adults who are susceptible of this action, is occasionally exerted in the throat and mouth in this destructive manner.

38. *E. The associations or complications* of inflammatory affections of the throat, in their partial or more general forms, are very numerous. They are commonly at first *symptomatic* manifestations of a more general or of a febrile nature; and they not unfrequently become most troublesome and even dangerous complications, not merely from their severity, but also from their extension, as shown above (§ 36), to one or more of the passages leading from the throat to other organs, and even to those organs themselves. In the exanthematous order of fevers, and sometimes also in the more simple continued fevers, these affections are often most serious complications. They are still more particularly so in scarlet fever, and sometimes in erysipelas of the head and face. They are often present in scurvy and other forms of cachexia; and they are frequently associated with the inflammatory states of dyspepsia, and in gastro-enteritic disorders, both acute and chronic. In many organic maladies seated in the abdominal and respiratory organs, chronic affections of the throat, and sometimes also of the mouth and tongue, often supervene, especially at a far-advanced stage of these organic maladies, and indicate depressed organic nervous power, and change of the circulating fluids; thus evincing an unfavourable and generally a fatal issue. The affections of the throat and mouth, in the advanced course of these maladies, especially of tubercular diseases of the lungs, often assume an apththous appearance, and increase the distress of the patient.

[M. Billard (*A Treatise on the Diseases of Infants*, translated by James Stewart) has called attention to the fact that the veil of the palate and the isthmus of the fauces, in young children, are generally red and injected, and that the whole pharynx is in a high state of congestion, its degree being in proportion to nearness to birth. In 200 children, aged from one to ten days, that had died from various diseases, he found the isthmus of the fauces injected in 190—the injection being generally uniform, but sometimes in the form of ramifications. The tonsils also partake of this congestion, showing the intimate connexion between the vascular system of the skin and that of the mucous membrane of the mouth, throat, and probably the whole intestinal canal.

Though it be sometimes difficult to recognise inflammation of these parts in young infants, for the reason just stated, yet it may be safely inferred, when the redness continues beyond the ordinary time of the disappearance of the congestion in young infants, viz., ten or twelve days; or when it occupies several points, instead of being spread uniformly over every part of the throat; or, lastly, when some of the other symptoms of cynanche exist at the same time with the redness, and it occurs at a time when the parts are not naturally congested.

If either this or the following form of inflammation occurs in infants, unless it be very slight, there will be difficult deglutition, regurgitations, or vomiting, with an expression of pain on attempting to swallow; tumefaction of the tonsils, with pain and tenderness of the neck on pressure, and an alteration of the cry and the physiognomy.

Inflammatory affections of the throat and fauces derive much of their importance from the fact that the same affections of the air-passages have their origin generally in the former, the inflammation extending by continuity to the respiratory tubes.

In disease, the mucous membrane lining the throat and air-passages becomes changed from the pale rose colour of health to a dark scarlet, purple, or violet colour, according to the form and insensity of the inflammation; if acute, the red or violet colour is nearly equally diffused over the whole surface, while in the chronic forms it appears in irregular circumscribed patches, presenting highly coloured centres, which become paler towards their circumference. In some cases we find the membrane lining the throat and fauces swollen and of a bright red colour, pouring out mucus or pus upon its surface. In another, the membrane appears tense and much injected, and, instead of pouring out a mucous secretion, is dry and glossy. In a third form, the investing membrane is pale, relaxed, and œdematous, while serous infiltrations distend the sub-mucous cellular tissue. In another, there is plastic exudation, forming a dense adventitious membrane, as above described by our author. In most of these latter cases, there will be observed at a very early period white or ash-coloured patches of albuminous exudation spread over the fauces and pharynx, while the membrane not covered by them is of a deep scarlet or Modena red colour. They are not unfrequently mistaken for

superficial sloughs, and, when cautiously removed, the membrane will be found divested of its epithelial coat. M. Bretonneau has recorded several cases where this false membrane extended down to the cardiac orifice of the stomach; while in other instances it lined the trachea and larger bronchial tubes.

There is still another form of disease of the throat, unnoticed by our author, which may be characterized as *follicular disease of the pharyngeal mucous membrane*, or *Follicular Pharyngitis*. This is *one*, and only one, of the forms of the disease which has been called *clergyman's sore throat*, to which we first called attention in an article entitled "An Enquiry into some of the Causes of Disease among the Clergy," and published in the "*Lit. and Theol. Review*," Sept., 1836. This affection has doubtless always prevailed to a greater or less extent, although from some unknown causes it has been far more prevalent since about the year 1830, when this country was visited by the influenza in an epidemic form. At first it appeared to be confined chiefly to public speakers, especially the clergy; but probably this was only apparent, inasmuch as this class would be more likely to apply for medical relief, in consequence of the inconvenience it occasioned in the discharge of their duties. Particular attention has been called to this disease of late, in consequence of its very general prevalence. Dr. Horace Green has described it under the name of *follicular disease of the pharyngo-laryngeal membrane*, and *tubercular sore throat*, while Dr. Porken has named it *Tubercles of the Larynx and Fauces*.

This disease consists essentially in inflammation of the mucous follicles, generally sub-acute, and terminating in hypertrophy, ulceration, or induration of these glandulæ, or infiltration of tuberculous matter into their substance. Whatever parts may be involved in the disease, it nearly always commences in the fauces and pharynx. *Follicular pharyngitis* is usually very insidious in its approach, and may exist for some time without causing particular inconvenience; at length, however, the voice grows husky, there is an uneasy sensation in the throat accompanied with frequent hawking and inclination to swallow, while there is a very copious secretion of viscid, opaque mucus poured out by the diseased follicles. There is rarely any cough, although there is more or less soreness about the region of the larynx. If we examine the throat at this stage of the disease, we shall find the mucous follicles hypertrophied, and the membrane injected, while the epithelial coat will have been more or less destroyed. If the disease have long existed, the follicles may be greatly enlarged, indurated, or filled with a yellowish substance resembling tubercular matter, while the membrane will be extensively covered with a layer of muco-purulent secretion. The disease may extend down the larynx, invading the vocal cords, when the voice becomes weak, hoarse, or husky, and may be wholly lost, or speaking is followed by a sensation of pain and soreness in the larynx, and there is more or less general as well as local debility. The absence of cough is a characteristic feature of this form of disease.]

39. V. Treatment.—i. Of Tonsillitis.—The treatment of tonsillitis is nearly the same as that of other forms of angina.—*A*. At the commencement of the complaint *acidulous* and *demulcent*, or *emollient fluids*, may be used; and the open mouth may be frequently held over a basin containing about half a scruple or scruple of camphor and an ounce of vinegar, on which about a pint of boiling water is poured, the patient directing the *fumes* from these towards the throat by placing half a sheet of paper before and above his open mouth, and under his nostrils, so as to allow respiration to be free. If the *vapour* from these excite cough (which it will not occasion if the paper be adjusted over the upper lip, so as not to allow the fumes to be respired by the nostrils) either the quantity of water may be increased, or that of the other ingredients diminished. A sufficiently active aperient and alterative pill ought to be given at bed-time, and a *purgative* draught in the morning; and the feet and legs should be plunged in warm water, containing salt and mustard, the *pediluvium* being repeated according to circumstances. In mild cases, or in delicate persons, these means, aided by *diaphoretics*, and by *embrocations* to the throat and neck, will generally be sufficient to remove the complaint; but in strong, robust, and sanguine habits of body, or when the febrile action is considerable, is sthenic or phlogistic, *venesection*, or *leeches* applied behind the ears, or both modes of depletion may be practised.* In large towns, and in persons living in low, close localities, and in the insufficiently nourished, *bloodletting* is as often injurious as beneficial. For males, *cupping* on the nape of the neck—the quantity of blood taken by it having due reference to the state of the patient—should be preferred; but for females, neither this mode of depletion, nor the application of leeches to the neck, is eligible, on account of the marks which are left by them. For these latter, therefore, *bleeding* from the feet while they are plunged in warm water, or the application of a few leeches below the groins, especially if the catamenia be delayed, suppressed, or difficult, or scanty, should be preferred. I have never seen much benefit derived from the application of leeches to the neck in tonsillitis; and the recommendation of some writers to apply them to the inflamed tonsils is generally repugnant to the patient, and is seldom advantageous.

40. *B. Fomentations* and *poultices*, of an irritant nature by some, and of an emollient kind by others, have been advised; either of these may be of service, and either of these may be quite useless.† I have generally prescribed *terebinthinate epithems* and *embrocations* to be applied around the neck, two or three folds of flannel being moistened by the substances prescribed, and covered by a napkin or handkerchief. These substances, conjoined with the turpentine, have been varied according to the features of the case, as directed in various parts of this work, and in the Appendix (see *Form.* 311); and are beneficial in all the forms of angina. They may be so prescribed as

* [We have found large doses of *Dover's Powder*, aided by a dilute warm solution of the *nitrate*, or *acetate of potash*, freely taken, very successful in arresting this disease. If inflammatory action runs high, a little *antimony* should be added. Free purging is indispensable, carefully avoiding all mercurials. If necessary, we apply leeches under the jaws and cups behind the ears. In many cases the treatment must be very active to prevent the formation of an abscess.—*Ed.*]

† [Dr. Watson says, "The only gargle which is admissible, in the commencement of the malady, is one of warm milk and water." Dr. South recommends the steam of hot water, taken through an inhaler.—*Ed.*]

to produce erubescence of the external surface, or as not to occasion this effect, according to the intention of the physician. In addition to the use of laxatives and aperients, or purgatives, and of diaphoretics, it has been usual to prescribe *gargles* to the throat. I have seldom seen them of much service. But refrigerant and emollient fluids, in the severe and *sthenically* inflammatory cases, as the nitrate of potass, solution of the acetate of ammonia or muriate of ammonia and mucilage, in camphor mixture, may be taken frequently, and held in the throat for some time, while the head is thrown back, before they are swallowed, or before they are thrown out.

41. *C.* The more *asthenic forms* of tonsillitis occurring in weak, ill-fed, or cachectic persons, or in those weakened by a foul atmosphere, or by previous disease, ought not to be treated by local or by general blood-letting. After the excretions and fæcal accumulations have been duly evacuated, organic nervous power and the depurating functions should be promoted by suitable means; and the local extension of the morbid action ought to be prevented by the applications which have been found most successful in attaining these ends. The action of the excreting organs should be increased by conjoining *tonics* with *aperients*, and these with the *alkaline carbonates*. These medicines may be taken at night or early in the morning, or at both periods; while the decoction of *cinchona*, with the compound tincture of cinchona and the solution of *acetate of ammonia*, may be given during the day. In many cases, the dilute *hydrochloric acid*, or the nitro-hydrochloric acids, or the pyroligneous acids, may be substituted for the acetate of ammonia; and each dose of such mixture may be held for some time in the throat, as just advised, before it is swallowed; or the same mixture may be used very frequently as a *wash* for the throat while the head is thrown back, and be afterward ejected. I have in these cases also prescribed the sulphate of quina with compound infusion of roses, dilute sulphuric acid, &c.; but I have had reason for preferring the medicines now advised, to this last. In the more asthenic—in the gangrenous, putro-adynamic, or malignant, as they have been termed—still more *astringent* and *antiseptic gargles* or *washes* for the throat may be prescribed, especially those with krameria, capsicum, sulphate of zinc, &c.; or those with the chlorides, or with chlorinated water or solutions; or others with decoctions of bark and pyroligneous acid or creasote. I have used with much advantage in those cases gargles and washes with strong *tar water*; and when this last is not too strong to swallow, then a portion of it will generally be taken into the stomach with manifest benefit. In these cases, also, the *fumes* arising from hot water poured over camphor, with myrrh, vinegar, or pyroligneous acid, and a little creasote, may be inhaled or passed into the throat, as directed above (§ 39), or the weak fumes of tar may be similarly used—or the vapour of hot water poured on tar.

[In this form of the disease, a strong solution of nitrate of silver (40 grs. to the ʒj.) will often prove useful, and there is reason to believe that in the first form an early application of the same would probably arrest its progress.]

42. Several other measures, besides those now mentioned, have been prescribed for tonsillitis. Dr. Monge has advised the tonsils to be *scarified*; and in the more chronic and indurated states of the disease this may be of service. M. Ranque prescribed the *pyroligneous acid* to the inflamed tonsils; M. Laennec, of Nantes, the insufflation of *powdered alum*; M. Bennati, *gargles*, with a strong solution of alum; and M. Guyton-Morveau, powdered *carbonate of lime*. These, as well as other applications about to be noticed, are more beneficial in the chronic enlargement of the tonsils than in the acute or early inflammations of those organs. *Gargles* of various kinds have been advised by numerous writers since the days of Hippocrates and of Avicenna—cooling and emollient gargles in the more sthenic or phlogistic cases; warm, stimulating, and antiseptic gargles in the asthenic or malignant; and astringent gargles when the disease is attended by relaxation. *Dry-cupping* on the neck has been recommended by Hippocrates, Aretæus, Paulus Ægineta, Kortum, and others; but to be useful it should be often repeated. *Emetics* were much used by the older writers in all inflammatory affections of the throat. They are most beneficial when such affections are complicated with torpor of the liver, or with biliary accumulations in the gall-bladder and ducts. When exhibited after the formation of matter in the tonsils, they generally occasion rupture of the abscess and immediate relief. *Blood-letting* has been very generally employed for the sthenic forms of guttural disease. Hippocrates, Celsus, Aretæus, Cælius Aurelianus, Alexander Trallianus, Avicenna, and many writers of the 16th and 17th centuries, advised the blood to be drawn from the sublingual veins; but the practice has fallen into so complete disuse, that no one at the present day is able to give an opinion as to its merits. Bleeding from the feet was likewise advised by many writers, but not so generally as bleeding from the raninal veins.

[We have frequently resorted to free scarification of the tonsils, in acute inflammation of the glands, with the best effects, and have seen no case made worse by this treatment. The scarifications should be shallow, and may be made with a palate-lancet, or a common bistoury, the edge of which is guarded nearly to the point. This operation, however, is not unattended with danger. Watson mentions one case of fatal bleeding from a wound of the internal carotid, and another where very serious hæmorrhage occurred from this simple operation. Lawrence mentions a similar case from premature puncturing of the tonsil, to evacuate matter. Sir B. Brodie relates two cases, where death from bleeding ensued from puncturing a tonsillar abscess. Portal, Allan Burns, and Tyrrell, all mention similar cases. The incision or puncture, in these cases, should be made directly backward, or from without, inward and backward, to avoid puncturing the internal carotid artery. Accidents of this kind, however, are extremely rare, and will never happen if the above directions be followed. In most cases of tonsillar abscess, the effort of vomiting, excited by emetics, is sufficient to burst the walls and discharge the pus; but this is attended with so much suffering, that it is far better to open the abscess. After the matter has been discharged, soothing gargles, with honey, should be frequently used, and commonly they produce a speedy cure. Astringent gargles are best suited to cases where the swelling still continues, although the inflammation has subsided. The internal use of powdered *guaiac*, in doses of ʒss. ev-

ery six hours, has been recommended as a specific in the cure of tonsillitis.]

43. *D.* When the disease has passed on to suppuration or to *abscess of the tonsils* (§ 8, *et seq.*), as it generally does if the above means fail to arrest it in a few days, then the distention attending this state almost threatens suffocation, and the cough, difficulty of breathing, or the occurrence of retchings, &c., tend to rupture the abscess, and relief is obtained. But before the distressing symptoms occur, and as soon as fluctuation is felt on applying the finger, an incision should be made for the escape of the contents. Frequently the abscess bursts before the symptoms become urgent, and the disorder soon subsides. If this should not be the case, the local and constitutional means already advised should be persevered in; and, if a chronic remittent or intermittent state of the disease follow, the means about to be noticed will generally succeed in restoring the parts to a healthy condition.

44. ii. The Treatment of Pellicular or Plastic Inflammation of the Throat has been the subject of much discussion both in this country and on the continent.—*a. Blood-letting*, general or local, or both, should be early employed, when the habit of body, age, and strength of the patient, and the sthenic character of the local affection and of the attending fever, indicate the propriety of the practice. But I have never seen much advantage obtained from too copious or too frequently repeated depletions in this malady. It should be recollected that the disease occurs chiefly in an epidemic form, and epidemics seldom require large depletions, even although vascular action may appear greatly excited. In these maladies the excitement greatly exceeds the amount of vital power. *Emetics* are more generally appropriate, and when blood-letting is proper, they should soon follow this measure, the terebinthinate *embrocations* already mentioned (§ 40) being applied around the neck and throat. *Purgatives* are of use, but of much less use than in the other forms of guttural inflammation. The bowels, however, should be kept in an open state throughout the disease by medicines taken by the mouth or administered in enemata, and all the depurating functions ought to be promoted.

45. *b.* The *local treatment* of plastic angina is of the greatest importance, and especially for the severe and rapidly spreading cases. For these the dilute *hydro-chloric* or *nitric acids*—the dilution being less in the most severe, and proportionably greater in the milder cases—should be applied by means of a piece of sponge firmly tied on the end of a piece of whalebone. Either of these acids, or a strong *solution of the nitrate of silver** [or *creasote*,] ought to be thus applied over and around the parts covered by the pellicular exudation, and the application repeated according to its effects and the urgency of the case. It should be carried sufficiently down into the pharynx, and over the base of the tongue and epiglottis, to prevent the extension of the exudation to the larynx.* In the milder cases, the *chloride of mercury*, or the *biborate of soda*, mixed in fresh butter or in honey, in the proportion of from one to two drachms of the former to an ounce of the latter, will prove quite as efficacious as the mineral acid or the nitrate. Having arrested the disease by these means, or having so employed them as to change the morbid action in the affected parts and to prevent its extension, the treatment about to be recommended for the next variety—the simple and complicated forms of diffused cynanche—may be pursued, appropriately to the features of individual cases. In most instances, the *fumigations* and *embrocations* advised above (§ 39, 40) will be sufficient to restore the local affection to health, when aided by the means requisite to promote the secretions and excretions, to allay febrile action when it is materially excited, and to support vital power when it is deficient. For these purposes the measures already mentioned and those about to be noticed are quite appropriate. MM. Bretonneau and Guillon at first advised the *insufflation* of a powder into the throat consisting of either the dried sulphate of alumina or chloride of mercury, mixed with powdered gum acacia; but it was found that the frequent passage of a portion of the powder into the larynx and trachea often occasioned unpleasant and even dangerous effects. The acids or the nitrate just mentioned—the former slightly diluted, the latter in strong solution, in the more severe epidemic cases—were therefore preferred by them and by others in this form of cynanche.

[Powdered *alum*, made into a paste with water and honey, and applied to the throat by means of a camel's-hair pencil or sponge probang, is often very beneficial. Great advantage will often arise from the use of a gargle made of salt, vinegar, and capsicum. A solution of chloride of soda or lime has been found useful. If the disease, however, be constitutional, little dependence can be placed on local measures only.]

46. iii. Treatment of Diffused Cynanche, simple and complicated.—*A.* This form of the disease is so frequently dependent upon disorder of the stomach, or of the biliary functions, or of the bowels, or of all these, that it is very often necessary to commence the treatment with an ipecacuanha *emetic*, promoting its action by drinking a warm infusion of chamomile flowers. *Blood-letting*, in this state of the disease, is seldom required, unless in persons of a gross, plethoric habit of body, when it may be advantageously employed, the quantity and mode of depletion being adapted to the peculiarities of the case. After the operation of the emetic, a full dose of calomel should be given, either alone, or conjoined with other *purgatives* and aromatics or spices, or with camphor, and according to the character of the febrile symptoms, and be followed in a few

* [In the application of *the nitrate of silver* in the follicular and other forms of pharyngeal inflammation, a solution of the crystals should be employed, the strength varying, according to the kind and degree of the inflammation, from one to four drachms to the ounce of distilled water. Where the follicles are enlarged and the disease has become chronic, the solution should be applied by the probang and sponge, at first every other day, for two or three weeks, afterward about twice a week, till the granular and vascular mucous surface assumes a healthy appearance. Where the diseased follicles are confluent, presenting a tuberculated form, they should be touched occasionally with the solid nitrate. Sometimes the mucous cryptæ in the posterior nares become diseased, causing a morbid and offensive secretion, which, falling down, keeps up an irritation in the posterior fauces. In such cases the disease may be reached by the curved syringe, using a solution of the nitrate of silver, of the same strength as before; or a piece of whalebone, bent to a right angle at a distance of one inch and a half from the end, and armed with a small piece of soft sponge, may be carried back of the velum, so as to come in contact with the affected parts. The syringe, however, is the most effectual. If the *uvula* be permanently hypertrophied, both thickened and elongated, excision will be advisable.]

* [In order to bring the pharynx fully into view, the spatula, bent to a right angle, should be employed.—*Ed.*]

hours by a stomachic purgative draught, and by a cathartic enema, if the operation on the bowels be insufficient. The terebinthinate *embrocations* and the *fumigations* mentioned above (§ 39, 40) should not be omitted, and the febrile or general disturbance ought to be treated conformably with the character which it may assume. In most cases I have found that, after the due operation of the above means, the decoction of cinchona, liquor ammoniæ acetatis, the sesqui-carbonate of ammonia, and compound tincture of cinchona, or the decoction with hydrochloric acid, &c., have soon removed all disorder. In most cases the *washes* and *gargles* of the throat already advised have also been of use.

47. *B. The Guttural Inflammations* which occur as *complications* of either local, general, or specific diseases, are of an asthenic or diffusive nature, and usually require the *tonic* or *restorative*, conjoined with the *alterative*, means already recommended. At the same time, the treatment appropriate to these ought to be enforced; and most commonly the measures which are the best suited to the primary disease are most beneficial for the guttural affection. In these complications, the *fumigations* of the throat, with stimulant and antiseptic substances, and *washes* or *gargles*, with similar or with astringent medicines (see § 41, 42), and *embrocations* applied externally as advised above (§ 40), are generally indicated and beneficial. The functions of the skin, kidneys, and bowels, ought to be duly promoted by conjoining such depurating medicines as the states of these functions may require, with tonics and alteratives; the best alteratives being those which depurate the blood, and at the same time neutralize or remove, or counteract morbid materials or elements which may accumulate in the blood, either previously to, or in the course of, developed forms of disease. Of these sufficient notice has been taken above, and in the article on the principles of Therapeutics.

48. *C. The Diet and Regimen* for inflammatory affections of the throat differ very much in different cases. In the more *sthenically* inflammatory the regimen should be strictly antiphlogistic, and the drinks or beverages allowed ought to be refrigerant, demulcent, or emollient, either of these properties predominating according to the states of the skin and urine. When the guttural affection is *asthenic* or diffusive, the beverages or drinks may be more restorative; and when the affection is severe or malignant, or is attended by an offensive or putrid odour of the breath, then *wine*, more or less diluted, may be given in the intervals between the exhibition of the *tonic* and *antiseptic medicines* mentioned above. The *diet* and *regimen*—or, rather, a successful adaptation of both to the intimate nature of the case—must be directed mainly by a correct interpretation of the states of the pulse and of the circulating fluids; and this interpretation can be attained only after close observation, profound thought, and diversified as well as extensive experience. The physician, thus enlightened, will adapt the means to the end, and will direct such diet and regimen as will be congruous not only with the state of the patient, but also with the internal and external remedies which are prescribed. Of the regimen, the most important part is the removal of the patient, from the operation of such miasms or exhalations as may have either caused or aggravated the complaint, to a pure or temperate and dry air. In all cases, also, however slight, moderation in the use of animal food, or even a temporary abstension from this food, as well as from malt or other fermented liquors, should be enforced, unless when wine or other beverages or drinks of a restorative kind are allowed medicinally. Wine ought to be restricted chiefly to the asthenic, diffusive, and complicated cases of the malady. During *convalescence*, the diet should be abstemious, and chiefly farinaceous. As strength is obtained, particularly after the more severe and complicated attacks, the food should be generous but digestible; and change of air, tonics, and tonic and alterative mineral waters, ought to be prescribed. Travelling, voyaging, and exercise in the open air, will also prove extremely beneficial.

49. VI. Structural Changes of the Throat and Tonsils.

Classif.—IV. Class, I. Order (*Author in Preface*).

Structural Lesions of the *Throat* and *Tonsils* are generally produced, 1st, by inflammation; 2d, by the syphilitic infection; 3d, by mercurial action; 4th, by the scrofulous diathesis and tubercular disease; 5th, by prolonged disorder of the digestive organs; and, 6th, by mechanical injury. These lesions may be confined to the tonsils, or to the pharynx, or to two or more of the parts forming the fauces and throat. Certain of them are noticed under the heads Palate and Uvula, Larynx, &c., and others are comprised under Venereal Diseases, the *Mercurial* Poisons, and Scrofula, owing to their being very important manifestations of these constitutional inflictions. In the brief view which will be here taken of structural lesions of the throat and tonsils, attention will be chiefly directed to those which are produced by inflammation, by disorders of the digestive organs, and by a cachectic or morbid diathesis, the exact nature and causes of which are often imperfectly ascertained. The *syphilitic* and *mercurial* sources of lesions of the throat are fully considered under the heads just referred to.

50. Organic lesions of the throat are most frequently the consequences of some form of inflammation—sthenic or asthenic, common or specific—the character, severity, or the duration of which is productive of alterations in the structure of one or more of the parts in which the inflammatory action has been chiefly manifested. These consequences are, suppuration or abscess; ulceration; œdema, or serous or sanious infiltration; ecchymosis; varicose state of the venous capillaries and congestion of vessels; exudations on the mucous surface of either an aphthous, pulpy, or membraneous nature, with or without superficial ulceration or excoriation; softening, tumefaction, pulpy degeneration and discoloration of the mucous and sub-mucous tissues; vesicular and pustular formations and ulcerations; phagedenic ulceration; sloughy or gangrenous disorganization, or sphacelation. These changes take place independently of either the *syphilitic infection* or the *mercurial poison*; although, in addition to the forms of ulceration and other structural changes peculiar to these poisons, certain of the alterations now enumerated sometimes acknowledge the same origin.

51. i. Structural Lesions of the Tonsils and Fauces have been partly considered above (§ 10, 24, *et seq.*). Superficial ulceration, relaxation of the fauces, elongation and œdema of the uvula, tumefaction and induration of the tonsils,

congestion or hyperæmia of the guttural surface, extending to the Eustachian tubes and to the glottis and rima glottidis, and increased mucous discharges from the affected surfaces, are the most frequent and the least serious changes which these parts undergo, and are generally the consequences of catarrhal inflammation, or of those less dangerous states of inflammation which depend upon disorders of the digestive organs, or which complicate exanthematous fevers, especially when the former of these become chronic, or frequently recur.—*A. Abscess* or suppuration has been already noticed (§ 8) as a frequent consequence of tonsillitis. It may also, although rarely, appear in the velum palati or the upper part of the fauces. *Œdema* and *serous* or *sanious infiltration*, ecchymosis, and softening of the fauces and tonsils, are most commonly the effect of the more asthenic or adynamic states of inflammation, as remarked in the guttural inflammations attending scarlatina, erysipelas, &c., or are consequent upon stomatitis, especially when occasioned by the mercurial poison. In these circumstances, the affected surface may be covered by grayish, shaggy or pulpy, dirty or sanious exudations. The plastic exudation which characterizes the pellicular form of cynanche (§ 21, *et seq.*), and the changes consequent upon affections of the throat in scarlet fever, are described under their respective heads.

52. *B. Vesicular* and *pustular formations* are rarely seen, and only in the severer forms of small-pox. In these cases the mucous tissue is softened, tumefied, and often covered by a plastic mucous secretion. *Excoriations* and exfoliations of portions of the epithelium of the fauces occur in the course of many of the affections of the throat, and are often connected with the several states of exudation noticed at this and other places. *Ulceration* of the tonsils and fauces sometimes follows the detachment of these exudations, but not so frequently as is commonly supposed; nor is phagedenic ulceration, or superficial sphacelation often seen, unless after the poisonous action of mercury, and in the complicated and malignant states of cynanche, as already shown (§ 36–38). The rapidly-destructive ulceration which characterizes *noma* or phagedenic stomatitis sometimes extends from the gums and cheeks to the fauces. The more *chronic* forms of ulceration are chiefly consequences of scrofula, syphilis, and mercurial action, and are noticed in other places.

53. *C.* In addition to *enlargement* and *induration* of the Tonsils, these bodies may contain, in their lacunæ or in their structure, substances varying in appearance and hardness from that of tubercle, to that of indurated calcareous formations—or small calculi. They consist of concentric layers in some instances, and of agglomerated grains in others; are of a yellowish white or grayish hue; the more soft and friable resembling tubercular matter; the harder containing phosphate and carbonate of lime. They vary in size from that of a millet-seed to that of a pea, and are often spontaneously detached from the tonsil. They are probably the more permanent or saline remains of small collections of pus, or of small chronic abscesses in the tonsils. Some of these contain, with the ingredients just named, a little fatty matter and a coagulated albumen. *Cysts* and *acephalocysts* are very rarely seen in the tonsils; and *cancer*, in its several forms, is as rarely found primarily in the tonsils, although it not unfrequently attacks parts in the immediate vicinity, and then often involves these organs. The tonsils and portions of the fauces may be destroyed by the ulceration produced by phagedenic stomatitis, or by syphilis, or by mercurial action, and be followed by cicatrization—the *cicatrices* ultimately contracting so remarkably the aperture of the fauces as not to allow the passage of the more solid kinds of food; but these occurrences are very rare. Fibrous *polypi* sometimes occur in the fauces, but much less frequently than in the posterior nares; and vary in form, as well as in firmness or softness. Their investing mucous membrane is generally spongy, is often ulcerated and disposed to bleed.

54. ii. Organic Lesions of the Pharynx.—These consist chiefly of *alterations of calibre*, of the changes consequent upon inflammation—especially *exudation*, *softening*, *abscess*, and *ulceration*—and of *fibrous* and *malignant formations*.—(*a*) *Dilatations* of the pharynx may be general as respects the parietes of the tube, and extend to the upper portion of the œsophagus, the parts thus presenting a *funnel-like shape*; or they may be partial, one side or part of the pharynx having become so much dilated as to form a *pouch* attached to the pharynx. In this latter case the muscular fibres are stretched, ruptured, or wasted, so that the pouch consists chiefly of mucous and cellular tissues; but these tissues may have been pushed out between the muscular fibres, thus forming, in the first instance, a *diverticulum* from the pharynx that has ultimately become dilated into a pouch. The funnel-like dilatations are often the consequence of constrictions of some kind in the œsophagus. *Constriction* of the pharynx is generally a consequence of malignant disease, or of tumours pressing upon the pharynx and upper portions of the œsophagus, or of the cicatrization following ulceration.

55. (*b*) *Inflammatory changes* are most frequently seen in the pharynx. These consist chiefly of *croupy* or *plastic exudations*, as described above (§ 20) and in the *art.* Croup; of *aphthous exudations* in cases of thrush; and of *pustular formations* in very rare instances, in variola or after tartar emetic has been given in excessive doses. *Exudations of blood* from the throat sometimes occur during catarrhal or other inflammation of the pharynx or fauces, especially when these are attended by much irritation of the glottis and severe cough. The blood generally is seen in streaks in the viscid mucous expectoration. When the lower portion of the pharynx is affected, and when there are retchings as well as cough, the discharge of blood is occasionally more considerable; and it is then difficult to determine whether it proceed from the pharynx, or the œsophagus, or the stomach, or even from the bronchi or lungs; and whether it is merely an inflammatory exudation or a consequence of ulceration These points can be determined only by the history of the case, by a careful examination of the sputa, and by a due consideration of all the phenomena. *Softening* of the internal coats of the pharynx, and especially of the mucous and submucous tissues, is seen in typhoid, exanthematous, and malignant fevers, and in scurvy and after the ingestion of caustic, alkaline or septic, or other poisons. *Abscess* or suppuration of the pharynx has been already noticed when treating of inflammation (§ 18). It may give rise to ul-

ceration, and to still more extensive and dangerous alterations of parts in the vicinity, as shown above; but *ulceration* is much more frequently produced by syphilitic infection (*see* Venereal Diseases). Ulceration generally takes place in the posterior portion of the pharynx, although it has, in rare instances, attacked the anterior or latter portions, and extended into the larynx or trachea.

56. (*c*) *Fibrous tumours* or *polypi* have been found in the pharynx, or implicating the upper region of it and the posterior nares; but they very rarely arise primarily from this portion of the alimentary tube. *Cancerous* or *carcinomatous* or *medullary formations* sometimes affect this part, but not so frequently as the œsophagus. In the cases of carcinoma of the pharynx which I have seen, the base of the tongue and the pillars of the fauces became implicated, and the canal or passage into the œsophagus narrowed, and ultimately so remarkably reduced as to render the conveyance of nourishment into the stomach most difficult or nearly impossible. The carcinomatous ulceration has in some instances been followed by fatal hæmorrhage before this change has supervened.

57. (*d*) *Foreign bodies* of various kinds, and especially the bones of fish or of other animals, may be fixed in the pharynx, or penetrate, partially or altogether, the parietes of the canal, and give rise to inflammation, abscess, &c. Foreign bodies of every possible kind may be swallowed or be attempted to be swallowed, and produce either immediate or more or less remote effects of a serious or dangerous nature, for which surgical as well as medical aid may be required—the former immediately, the latter subsequently. Of *wounds* of the pharynx it is not my province to speak.

58. iii. Treatment *of Organic lesions of the Throat.—a. Enlargement and Induration* of the tonsils are generally the consequences of neglect of the slighter forms of tonsillitis, of repeated returns of the disease, or of the chronic remitting forms already mentioned (§ 9, 10), especially when occurring in the scrofulous diathesis, and in delicate persons. For these states of disease numerous methods of cure have been employed. The scarifications and local means already noticed (§ 39, *et seq.*) may be first tried; and if these fail, the measures about to be advised may be employed, and modified according to circumstances, while the general health should be promoted by change of air, and by a suitable diet. But, with the promotion of health and strength, the several depurating functions must be regulated and severally increased. Tonic infusions or decoctions with hydrochloric or nitro-hydrochloric acid, or with pyroligneous acid, or, instead of acids, the alkalies and the iodide of potassium, or the chlorate of potass, may be severally prescribed. The local application, by means of a hair brush, of a weak tincture of iodine, or of a strong solution of the nitrate of silver, or of dilute nitric, or hydrochloric, or pyroligneous acid, has often been found of the greatest service, especially while the iodine ointment or terebinthinate embrocations have been applied externally.

59. *b.* The *removal* of enlarged and indurated tonsils has been advised since the days of Celsus down to the present time. Some surgeons have employed ligatures to the enlarged tonsil, others have had recourse to excision. Unless the enlargement have resisted scarifications and the means already recommended, after a sufficient trial has been given, and unless the enlargement greatly impedes the voice, speech, and deglutition, I would not advise either of these operations to be performed; for, knowing that the functions of the tonsils are to secrete a lubricating fluid, for the superior orifice of the glottis, and for the epiglottis and pharynx, it necessarily follows that the extirpation of these organs deprives these parts of what is essentially requisite to the healthy discharge of their offices. Hence the throat becomes unpleasantly dry and husky. Voice and speech are thereby remarkably injured, and are incapable of being exerted for any considerable time. These effects I have observed to follow in numerous cases where the officious interference of surgeons has removed these organs. I have not known an instance of a female who had had a good voice who did not entirely lose it after the extirpation of the tonsils; and a similar result has often followed the excision of the uvula close to the velum palati.*

[Where the tonsils are permanently enlarged and indurated, we have uniformly found local applications unsuccessful in reducing their size, and have resorted to excision as the only certain remedy. We have not often found it necessary to remove the entire gland; nor, when this only is done, is there any reason to fear that change in the voice, speech, and deglutition referred to by our author. In regard to the effects of the entire removal of the *uvula*, Mr. Yearsley states that the utmost pains have been taken to ascertain the results of the loss of the uvula, but in no one case can he find that the slightest inconvenience has arisen from its removal. Dr. H. Green also remarks, "In a large number of cases where I have found it necessary to amputate the uvula, I have not been made aware, in any instance, of the occurrence of inconvenience, either from its partial or entire removal. Ordinarily, however, I have not considered it advisable, in the operation, to

* [Dr. *F. H. Hamilton*, of Buffalo, has published a history of fifty-two cases of enlarged tonsils, which he has extirpated (*Buff. Med. Jour.*, vol. iii., p. 189). In all the cases the glands were simply enlarged and slightly indurated, except in six or eight instances, where a few small tubercular deposits were found in them. Dr. H. has never seen them scirrhous or affected with any other malignant disease. In ten the enlargement was attributed to scarlatina, in seven to whooping-cough, in three to croup, and in eighteen to hereditary predisposition. Many of the patients had a scrofulous look, and some had enlargement of the cervical glands. The tonsillar enlargement was generally noticed between the fourth and seventh year of life. When left to themselves, Dr. H. thinks, enlarged tonsils will usually disappear before the twentieth year; but, as they predispose to tonsillitis, bronchial diseases, and croup, impair the general health, speech, and hearing, and cause dulness of intellect and petulance of feelings, &c., he advises their removal by excision. He has seen little benefit from other local means or general treatment. Excision should not be performed, however, when the tonsils are inflamed, unless the patient is threatened with suffocation, nor if the patient has a hæmorrhagic diathesis, nor if no other reason can be assigned than that they are enlarged. The operation may be performed at almost any age. Three operations were made on children two years of age. To check the bleeding a gargle of cold water will usually suffice, and if this does not succeed, apply snow or pounded ice or cold wet cloths about the neck, and especially opposite the seat of the tonsil. Dr. H. recommends the removal of the *entire* gland, as less likely to be followed by copious hæmorrhage. If one half only is removed, the enlargement, he thinks, is apt to go on. Neither the speech nor hearing is apt to be improved until after the lapse of months after the operation is made. Dr. H. has never known the speech or voice to be injuriously affected by the removal of the tonsils or uvula, nor any other inconvenience result from the operation.—*Loc. cit.*]

practice total excision, but have generally found it necessary, and quite sufficient, to remove the greater part of this organ."—*A Treatise on Diseases of the Air Passages*, &c., New York, 1846, p. 209. This writer also states that he has not met with a single case where any serious inconvenience resulted from the subsequent hæmorrhage. One such case, however, was communicated to us recently by Prof. T. CHILDS, of Pittsfield, Massachusetts, where death was the consequence. Sir ASTLEY COOPER advises to remove only so much of the uvula as to reduce it to its proper proportions, believing that if the whole were removed, fluids could not be taken without their passing into the nostrils, and the articulation would be injured. Dr. SOUTH remarks that he does not advise it, because he knows it to be unnecessary; that "it is commonly sympathetic with irritations of the alimentary canal, and when that is quieted, the uvula resumes its ordinary length."—*Chelius's Surg.*, vol. i., p. 167. It often becomes very red, elongated, and swollen in the course of an hour, and by dropping on the epiglottis, excites a constant hacking cough, and frequently a sense of choking, which may be partially relieved by closing the mouth and breathing through the nostrils.

Dr. PARISH, of Philadelphia, has recorded two cases where the voice underwent a peculiar change from the excision of the tonsils. Here the voice was rendered shrill and whistling, and we have observed the same modification in other cases from the same cause.—*Trans. of the Coll. of Phys. of Phil.*, Nov. and Dec., 1841, and Jan., 1842.]

60. *c.* The treatment of organic lesions of the throat and tonsils consists chiefly of the early opening of abscesses or small collections of matter when these form, as stated above (§ 42, 43); of the employment of the local and constitutional means already advised when the tonsils remain enlarged and indurated; of the fumigations and washes, astringent, tonic, and antiseptic, when ulceration, softening, &c., affect any portion of the throat; and of the several means above directed, and the diet and regimen recommended for the asthenic and chronic forms, and for the usual consequences of guttural inflammations. In all cases, support of the constitutional powers, attention to the state of the bowels and kidneys, to the digestive functions generally, and to diet and change of air, are most important. Air, food, and water, are influential both in producing and in removing affections of the throat, whether functional or structural; and upon a judicious attention to, and avoidance or selection of these, appropriately to the nature of each affection, the success of treatment will mainly depend.

BIBLIOG. AND REFER.—*Hippocrates*, Περὶ Νοσῶν, Op. 464.—*Celsus*, lib. iv., cap. 4.—*Aretæus*, De Caus. et Sig. Acut. et Diut. Morb., lib. iv., cap. 9.—*Cœlius Aurelianus*, Acut. et Chron. Pass. libri quinque, lib. iii., cap. 2.—*Avicenna*, Canon, lib. iii., fen. 9, tr. 1, cap. 8.—*J. A. Foglia*, De Faucium Ulceribus, 4to. Neap., 1563.—*J. Weir*, Medicar. Observat. Rariar., lib. i., De Pestilentiali Angina, 4to. Basil, 1567.—*F. Nola*, De Epidem. Phlegmone Anginosâ, grassante Neapoli, 4to. Venise, 1610.—*J. de Villaréal*, De Signis, Causis, et Curatione Morbi Suffocantis, lib. ii., 4to, 1611.—*F. P. Cascales*, De Morbo Garrotillo Appellato, 4to Madrid, 1611. — *P. Forestus*, Observat. et Curat. Medicin., lib. vi. et xv.—*J. A. de Fontecha*, De Angina et Garrotillo Puerorum, 4to. Alcala, 1611.—*Mercado*, Consult. Morbi Complicati et Gravis. Frankft., 1620.—*J. A. Sgambati*, De Pestilenti Faucium adfectu Neapoli Sæviente, &c., 4to. Neap., 1620.—*J. B. Carnevale*, De Morbo Strangulatorio Affectu. Neap., 1620.—*F. Nola*, De Epidemica Phlegmasi Anginosâ Grassanti. Neap., 1620.—*A. Tamayo*, De Morbo Garrotillo. Madrid, 1622.—*L. Nunnez*, De Gutturis Ulceribus Anginosis, 4to. Seville, 1615.—*C. P. de Herrera*, De Scientia, Causis, Præsagio, et Curatione Faucium et Gutturum Anginosorum, 4to. Madrid, 1615.—*J. A. Foglia*, De Anginosâ Passione, 4to. Neap., 1620.—*T. Bronchoti*, De Populari, horribili ac pestilenti Gutturis et annexarum Partium Affectione. Naples, 1622.—*M. A. Severino*, De Pestilenti ac Præfocanti Pueros Abscessu, &c. Neap., 1641.—*Zacutus Lusitanus*, Opera Omnia. Lyon, 1642.—*J. D. Prosimi*, De Faucium et Gutturis Anginosis et Pestiferis Ulceribus, 4to. Messina, 1633.—*C. Signini*, De Morbo Strangulatorio, 4to. Rom., 1636.—*Riverius*, Observat., Commun., &c., p. 353. (*Calculi in Tonsil.*)—*M. A. Alaymo*, Discorso intorno alla Preservatione del Morbo Contagioso e Mortale che regna al presente in Palermo, 4to. Palerm., 1625.—*J. B. Cortesius*, Miscellan. Medicor. Decades duæ, lib. ix. De Pestilenti Angina, fol. Mess., 1625.—*G. G. de Pina*, Tratado del Garatillo, 12mo. Zaragossa, 1636.—*T. Bartholinus*, Exercitationes de Angina Puerorum Campaniæ Siciliæque Epidemica, 12mo. Paris, 1646.—*Dodonæus*, Observat., cap. 8, 15. (*Abscess of the Tonsils breaking externally.*)—*Zacutus Lusitanus*, De Med. Princ. Hist., lib. i., Hist. 77. (*Caused by suppression of the Catamenia.*)—*J. H. Stark*, De Angina Alba seu Prunella, vulgo Weisse bräune. 4 Reg., 1690.—*Bonet*, Sepulchret., lib. ii., sec. xxiii. (*Assoc. with dis. of Liver.*)—*Malouin*, Histoire des Maladies Epidemiques Observées à Paris, in the Mem. de l'Academ. des Sc. de Paris, 1746, p. 151; 1747, p. 563; 1748, p. 531; 1749, p. 113; et Mem. de l'Academ. de Chirurg., t. v., pp. 423, 461—*Garnier*, An Anginæ Gangrenosæ emeticum, &c., 4to. Paris, 1750.—*Boucher*, Lettre sur des Maux de Gorge Gang. epidemiques, in Recueil Périod. d'Observat. de Med., t. viii., p. 557.—*Raulin*, Des Maladies Occasionées par les Variations de l'Air, 12mo, p. 261. Paris, 1752.—*Astruc*, Lettre sur l'Espece de Mal de Gorge Gangreneux qui a regne parmi les enfans l'année 1748, 4to. Paris, 1748. (*This and other histories of epidemic cynanche, prevailing throughout various parts of Europe during the middle of the eighteenth century, were strictly those of epidemic Scarlet Fever.*)—*J. Fothergill*, An Account of the Sore Throat, attended with Ulcers; a disease which hath of late years appeared in this city and in several parts, &c., 2d edit., 8vo. Lond. 1748.—*J. Wall*, An Account of a successful Method of Cure in the Ulcerated Sore Throat. Lond., 1751. (*Vapour of hot water with the fumes of vinegar, myrrh, &c., inhaled through the throat.*)—*M. Ghisi*, Lettére sopra le Angine epidemiche degli anni 1747, 1748. Cremona, 1749.—*Starr*, in Philosoph. Trans., 1750.—*J. Huxham*, A Dissertation on the Malignant, Ulcerous Sore Throat, 3d edit., 8vo. Lond., 1759. (*Advised chiefly tonic restoratives; preparations of Cinchona, and his Tinct., the Tinct. Cinchonæ comp.*)—*M. Chomel*, Dissert. Historique sur l'Espèce de Mal de Gorge Gangreneux, &c., 12mo. Paris, 1749.—*J. S. Zapf*, Synop. Observat. Med. cum Hist. et Cur. Anginæ, 174–176, 8vo. Lugd. Bat., 1751.—*N. Torriano*, A Histor. Dissertat. on a part. Species of Sore Throat among Children, 12mo. Lond., 1753.—*C. Colden*, Letter concerning the Throat Distemper, in Med. Observ. and Inquiries, vol. i., 8vo. Lond., 1755.—*Anon.*, Letter from a Bath Physician to Dr. Heberden on the Malignant Sore Throat, 8vo. Lond., 1758.—*J. Chandler*, Of the Dis. called a Cold; also of the Nature and Seat of the Putrid Sore Throat, 8vo. Lond., 1761.—*J. Johnstone*, A Treatise on the Malignant Angina, or Putrid and Ulcerous Sore Throat, &c., 8vo. Worcester, 1779.—*Morgagni*, De Sed. et Caus. Morb. ep., xliv., art. 3; lxiii., art. 16.—*P. Penrose*, Dissert. on the Inflammatory, Gangrenous, and Putrid Sore Throat, 8vo. Lond., 1766.—*P. A. Marteau de Granvilliers*, Descrip. des Maux de Gorge Epidémiques et Gangreneux, 8vo. Paris, 1768.—*S. Bard*, Researches on the Nature, Causes, &c., of Sore Throat, 8vo. New York, 1771.—*W. Fordyce*, A new Inquiry into the Causes, &c., of Putrid Fevers, with an Appendix on the Malignant or Ulcerated Sore throat, 8vo. Lond., 1773.—*W. Grant*, Account of a Fever and Sore Throat in London, 1776, 8vo. Lond., 1777. — *Read*, Hist. de l'Esquinancie Gangrénense de Moivron, 8vo. Paris, 1777.—*G. Levison*, An Account of the Epidemical Sore Throat, 8vo. Lond., 1778. — *W. Saunders*, Observat. on Sore Throat and Fever, 8vo. Lond., 1778.—*R. Saunders*, Observat. on the Sore Throat in the North of Scotland in 1777, 8vo. Lond., 1778.—*Meza*, in Acta Regia Soc. Reg. Med. Haun., vol. ii., p. 326.—*Musgrove*, De Arthritide Anomala, cap. 13. (*In the Gouty diathesis and complicated with Gout.*)—*Weiss*, De Angina Juvenum ex tarda et difficili Eruptione Dentium Sapientiæ, 8vo. Leip., 1776.—*T. Skeete*, Experiments on Bark, with remarks on Putrid Sore Throat, 8vo. Lond., 1786.—*W. L. Perkins*, An Essay for a Nosological and Comparative View of the Cynanche Maligna, 8vo. Lond., 1787.—*W. Rowley*, Essay on the Malig. Ulcerated Sore Throat, 8vo. Lond., 1788.—*T. Reeve*, An Essay on the Erysipelatous Sore Throat, 8vo. London, 1789.—*J.*

Clark, Observat. on Fevers, &c., and on Ulcerated Sore Throat, 8vo. Lond., 1792.—*T. Johnson*, Dissert. on the Putrid Ulcerated Sore Throat, 8vo. Philadelphia, 1793.—*Goesche*, De Ang. Inflam. et Catarrh. ab Menstruorum Suppressione Nata. Jenæ, 1798.—*E. Peart*, Practical Informat. on the Malignant Sore Throat, 8vo. Lond., 1802.—*Renauldin*, Dict. des Sc. Med., t. ii., art. *Angine*.—*Guersent*, Dict. de Med., t. ii., art. *Angine*.—*P. Bretonneau*, Des Inflammat. Specielles du Tissu Muqueux, &c., 8vo. Paris, 1823. — *Sachse*, Encyclop. Wörterb., b. ii., art. *Angina*. — *Roche*, Dict. de Méd. Prat., vol. ii., art. *Angine Conennense*.—*Tweedie*, Cyclop. of Pract. Med., vol. iv., p. 175.—*E. Gendron*, in Journ. Complement. des Sc. Méd., t. xxiii., p. 346, et t. xxx., p. 269. (*On Pellicular or Plastic Angina.*)—*Deslandes*, in Journ. des Progres des Scien. Méd., t. i., p. 152. Paris, 1827.—*Billard*, in Archives Génér. de Méd., t. xx., p. 491. (*On the use of Calomel in Pellicular Angina.*)—*Lessine*, in Ibid., t. xxiii., p. 519.—*Emangard*, Mem. sur l'Angine Epidemique ou Diphtérite, 8vo. Paris, 1829.—*Brunet*, in Ibid., t. iii., p. 536. (*Contagious.*)—*Schmidtmann*, Observ. Medic., t. ii., p. i. (*Simple and complicated Angina.*)—*Mayer*, in Dublin Journ. of the Med. Scien., Sept. 1837, p. 126. (*Cases of Plastic Angina.*)

[Am. Bibl. and Ref.—*Horace H. Hayden*, On Diseased Tonsils, in N. Y. Med. Repository, vol. i., New Series, p. 128, 234, 323.—*Horace Green*, A Treatise on Diseases of the Air Passages, &c. N. Y., 1846, p. 270.—*James Stewart*, A Practical Treatise on the Diseases of Children, 3d ed., 8vo. N. Y., 1845, and translation of Billard.—*S. D. Gross*, Elements of Path. Anatomy, 8vo. Phil., 1845.—*D. F. Condie*, Am. ed. of Watson's Lectures on the Prin. and Prac. of Phys., 3d ed. Phil., 1850, p. 491. (Dr. C. speaks very favourably of the frequent application of the *Iodide of Zinc* to enlarged tonsils to promote their rapid absorption. See *Trans. Coll. Phys. of Phila.*, No. vii., p. 191.)—*John Bell*, Lect. on the Theory and Prac. of Physic, 2 vols. Phil., 1848. (Dr. B. has given a very full and able account of this disease under the names of *Angina Membranacea* and *An. Mem. Maligna*, to which the reader is referred for farther information.)—*G. B. Wood*, A Treatise on the Practice of Medicine, 2 vols. 8vo. Phil., 1847.—*Ira Warren*, in Bost. Med. and Surg. Jour., 1852.—*Joseph A. Gallup*, Sketches of Epidemic Diseases in the State of Vermont, 8vo. Boston, 1815. (Dr. G. describes the "*Scarlatina*," "*Malignant Sore Throat*," or "*Canker Rash*" as very prevalent in New England from 1783 down to his own times. It was very fatal between 1787 and 1790, and went by the name of *Throat Distemper*.) See N. Y. Med. Repository for notices of this disease, and N. Eng. Jour. Med., also Bost. Med. and Surg. Jour., and Am. Jour. Med. Sci.—*F. H. Hamilton*, Buffalo Med. Jour., vol. iii., p. 189.]

THRUSH.—Synon.—*Aphthæ or Aphtha*, Ἀφθαι, Hipp., Gal. (from ἅπτω, I inflame). *Pustulæ Oris*, Haly Abbas. *Ulcuscula Oris*, Auct. *Stomacace*, Ploucquet. *Alphtha*, Sauvages. *A. Infantilis*, Plenck. *Aphthæ*, Vogel. *Aphtæ*, Pinel. *A. Lactantium*, Bateman. *Cystisma Aphthosum, Typhus Aphthoides*, Young. *Emphysis Aphtha*, Good. *Aphthes, Muguet*, Fr. *Schwämmchen, Mundschwammenchen, Mehlhund*, Germ. *Afte*, Ital. *Thrush*.

Classif. — III. Class, I. Order (*Author in Preface*).

1. Defin.—*Numerous white curd-like specks or exudations on the tongue and insides of the lips, gradually spreading to the interior of the cheeks and fauces; preceded and attended by fever or constitutional disturbance, and very often symptomatic of disorder of the digestive organs, or of structural disease.*

2. *Thrush*, or *Aphthæ*, was divided by Dr. M. Good into three varieties: 1. *Aphtha Infantum*; 2. *A. Maligna*; 3. *A. Chronica*. The *first* and *second* differ chiefly in the degree of vital depression by which each is attended. The *third variety* is always symptomatic, generally of structural disease. The *first* has been considered as a primary or idiopathic affection by some writers, but this may be viewed as somewhat doubtful, for it is very generally preceded by disorder of the digestive functions, and by more or less constitutional disturbance; and hence it may be viewed as contingent upon, or as a peculiar manifestation of, such disorder. It has been often mistaken for, or confounded with, the erythematic, the pseudomembraneous, and the ulcerated forms of Stomatitis (*see that article*), from which it is quite distinct. In the true thrush there is neither pustulation nor ulceration, but an exudation, at numerous points, of a white, curd-like matter, enlarging and spreading more or less along the buccal, pharyngeal, and œsophageal mucous surface.

3. i. Causes. — This disease may attack all ages, but with a very different degree of frequency. It is most common in infants, especially those at the breast or only a few months of age. In these, particularly in the two first months of existence, it has been viewed as an idiopathic affection. However, this view is merely conventional, and may be entertained in respect of this affection with a considerable share of justice. M. Veron believed that this disorder may even affect the fœtus. I am not, however, aware whether or no it has been seen in any case at the time of birth. It is rarely observed in adults, and still more rarely in aged persons. When it occurs at a more advanced period than that of early childhood, it is generally symptomatic of, or at least complicated with, some visceral disease. It occurs most frequently in children of a feeble constitution and in those who breathe an impure air. The seasons have no very manifest influence in causing it. M. Valleix, however, considers it to be most prevalent in hot seasons. Van Swieten says that it is rarely met with in very cold and very warm climates, but apparently from insufficient evidence. M. Guersent remarks, that in temperate countries it is somewhat more frequent in cold and wet seasons, and when catarrhal affections are most prevalent. This seemed to be the correct opinion; but the crowded or ill-ventilated wards of lying-in, or children's hospitals, and even such wards, however well aired; low, humid, and close apartments and localities; insufficient, unwholesome, and inappropriate nourishment; and whatever impairs the vital powers, are the chief causes of this affection, especially in children. Hence it is frequently observed in those who are attempted to be brought up by hand, or who have sickly nurses with poor or unhealthy milk; in the children of ill-fed or drunken mothers, and in those who are suckled by nurses with inflamed and irritable nipples. Boerhaave attributed the affection to protracted suckling in many cases, and to the premature or improper use of purgatives. It does not appear to be infectious or propagated from one child to another, although it may be produced in more than one by the unhealthy state of the nurse's breast or milk.

4. ii. Symptoms.—According to M. Valleix, the thrush is very often preceded by erythema of the groins and the posterior and upper parts of the thighs, which may have existed several days before the affection of the mouth appears. This is certainly the case in many instances, and is an indication of irritation, or a disordered state, of the digestive mucous surface, the circulating fluids being also imperfectly elaborated, or containing excrementitious elements. At the commencement of the complaint, redness, dryness, and heat are perceived in the mouth, and the infant evinces pain, fretfulness, or restlessness, or even disinclination to seize the nipple when applied to the breast of the nurse. At this time, dryness of the skin, frequency of pulse, and various other febrile phenomena are present. This may be called the

first or *erythematic period* of the disease, and is almost identical with erythematic stomatitis—*Stomatitis erythematica.* (See Stomatitis, § 3, *et seq.*)

5. *A.* The *characteristic features* of the disease, the *eruptive* or *second stage*, is shown by whitish points or minute white specks in the surface of the inflamed membrane. These specks first appear on the point of the tongue and on the insides of the lips and cheeks. They soon increase in number, enlarge, the nearest uniting and forming irregular but thin small patches, which remain separate or distinct, are after a time detached, and again renewed. As long as these minute albuminous exudations continue distinct—*aphtha discreta*—the complaint is comparatively mild; but they are successively thrown off in thin flakes, the inflammation subsiding at periods varying from seven days to three or four weeks. In severer cases, however, the patches of albuminous exudation increase in size and thickness, unite or run into each other, forming one continuous coating; and extend over the tongue, fauces, and pharynx—*aphtha confluens.* In these cases, the cream-like albuminous exudation covers the greater part of the mouth and fauces, becomes daily thicker or deeper; and, when it is thrown off, the mucous surface, deprived of its epithelium, reproduces a new exudation, softer and more curd or cream-like than the former. The colour of this is at first white, but it becomes yellowish in the course of a few days, the child being more and more enfeebled and emaciated. The pulse is now quick, weak, and small, the stomach irritable, the bowels disordered, and emaciation increased. Subsequently vomitings occur, the matters ejected being mucous, curdy, and of a yellowish or greenish tint; and the substances taken into the stomach being hardly changed. Diarrhœa often supervenes, with extreme prostration; but death sometimes takes place before diarrhœa becomes apparent or at least urgent, owing to the severity of the gastric symptoms, to the impossibility of deglutition, and the rapidly progressive exhaustion. In these cases the surface of the œsophagus, stomach, and duodenum presents a similar appearance to that of the mouth and throat, the villous coat being covered by numerous dirty, grayish, or yellowish elevated specks or patches of exudation; and the villous and sub-villous cellular tissue being injected, tumid, softened, and most readily torn or detached from the muscular coats. When diarrhœa takes place and becomes urgent, and especially if tormina, straining, or dysenteric symptoms occur, the aphthæ disappear, almost or altogether from the mouth, the vomitings frequently cease, and food is sometimes even taken and retained. But the evacuations are frequent, painful, mucous, or curdy, sometimes streaked with blood, or contain shreds of lymph or exudation, and are often offensive or emit an acid odour. Excoriations appear at the anus, the sphincter being irritable and constricted, and miliary pustules occasionally break out in different parts of the body. Although in these the duration of the disease is protracted, the ultimate result is not much more favourable than in the former class of cases.

6. *B. After death* the small and large intestines present the most marked indications of change; the appearances of these viscera, as well as the symptoms during life, showing that the disease which had originated in the mouth had traversed the œsophagus, stomach, and the whole intestinal canal, the upper portions of this canal having been more or less restored to a healthy state after the lower portions had become affected. The bowels are covered interiorly by a pulpy exudation, more marked in some places than in others, and of a yellowish gray or brown tint. The villous and sub-villous tissues are tumid, softened, and very lacerable, the epithelium being thickened and opaque. Whether the morbid exudation be external to, or beneath, the epithelium has been a subject of discussion. According to my own observation, it appears to take place beneath this covering in some situations, especially in the mouth and at the anus, where the epithelium is more fully developed, and above or externally to it in other situations, and to be attended by a thickening or a detachment of the epithelium in most places.

7. *C. The nature of Aphthæ* has been discussed by several recent writers referred to hereafter. Aphtha is so very closely allied to the plastic forms of stomatitis and cynanche, as to warrant the opinion that it is merely a modification of these, resulting from the age, constitution, strength, habit of body, &c., of the patient, in connexion with the extrinsic causes and influences producing it. According to the ages, habit of body, states of the circulating fluids, and to various external influences, aphtha, the allied affection, named muguet or blanchet by French pathologists, plastic stomatitis, pseudo-membraneous cynanche or quinsy (the diphtherite of Bretonneau), and croup, are merely varieties of one disease marked by different grades of acuteness, by the sensible qualities of the morbid exudation which chiefly characterize them, and by the parts on which this exudation appears, and to which they severally are most prone to extend. While aphtha, muguet, and plastic stomatitis, on the one hand, most frequently occur in infants at the breast, oftenest arise from intrinsic causes, and most frequently extend to the alimentary canal; pseudo-membraneous cynanche and croup, on the other hand, more frequently affect older infants and children, oftenest proceed from extrinsic causes and influences, and most frequently extend to the respiratory passages.

8. *Muguet* or *Blanchet*, which several writers have considered as a distinct affection from aphtha, and from plastic stomatitis and cynanche, is merely a modification of these; or it holds an intermediate place, approaching very closely to aphtha in its sensible characters, and in its marked disposition to extend along the alimentary canal; and presenting appearances allied to the plastic or pseudo-membraneous forms of stomatitis and cynanche, especially as respects the morbid exudation, as seen in the mouth, or in other parts of the digestive tube. Thus the variety of these affections, termed *Muguet* by French pathologists, may be placed between aphtha and plastic stomatitis, with which, as well as with pseudo-membraneous cynanche and with croup, it presents very intimate relations.

9. All the affections now named are to be viewed not merely as simple inflammations of the mucuous surface or membrane in which they are seated or to which they extend, but also as special or peculiar in their states or characters, particularly in the superficial nature of the inflammatory action; in the plastic condition of the morbid exudation, varying, however, in consist-

ence, cohesion, colour, &c., in each affection; in the manner in which the epithelium of the affected surface is involved in the exudation; and in the marked disposition they all possess to extend along the mucous surfaces, without materially affecting subjacent tissues. These characteristics, especially the disposition to extend continuously, and the states of the morbid exudation, may be ascribed to impaired, or originally deficient vital power, allowing the extension of the morbid action; to an imperfect power of limitation or vital resistance; and to the condition of the circulating fluids, these fluids abounding most probably in albuminous and imperfectly assimilated elements and materials, and being deficient in hæmatosine or duly developed blood-globules.*

10. *D.* Recent microscopic observers have detected in the cream-like exudations of aphtha, especially in the advanced and most unfavourable states of the malady, when vital power is most depressed, *parasitic vegetable productions* of the most minute and lowest forms. These parasitic formations appear during life in these states of the disease, or immediately after death; and when they form during life they multiply remarkably after dissolution. They can be viewed only as the evolution of the lowest grades of organization in the morbid secretions which take place from surfaces during the most depressed conditions of vitality, and upon the departure of the vital manifestations from the several textures of the body; their multiplication taking place with remarkable rapidity, especially on the more exposed surfaces. They belong to the class *Cryptogamia*, and are low forms of *algæ* and *fungi*. These, which appear on the mucous surface of the mouth and digestive canal, are chiefly the following: 1st. *Oidium albicans* (Berg, Vogel, Robin); *Aphtophyte* (Gruby); the cryptogamia of aphtha and diphtheritis. 2dly. *Sarcina ventriculi* of Goodsir; the *Merismopædia ventriculi* of Robin. 3dly. The *Leptothrix buccalis* of Robin; alga of the mouth. 4thly. The *Cryptococcus cerevisiæ*, Kutzing; the *Torula cerevisiæ* of authors; the yeast-plant. Of the opinions lately entertained as to the formation of these and other parasites some notice will be taken when those which form in Tinea are mentioned.

11. II. Treatment.—The means commonly resorted to by the ancients for this disease were in many respects the same as those employed in the present day.—*A.* Celsus advised alum in honey as a local application for aphtha; and Avicenna subsequently, and Lindt and Stoll in modern times, recommended the same. Honey, myrrh, crocus, and various detergents were prescribed by Paulus Ægineta; and aromatic tinctures with honey, by Riedlin. Borax and other detergents were employed, in mucilage, by Ackermann, in honey by Gooch, with cinchona, in honey by Loefler, and in sirup of roses by Starke. Camphor was used locally in honey by Avicenna, and the sirup of mulberries by Riedlin. The pomegranate fruit and bark were also employed locally by Actuarius; the sulphate of zinc was similarly prescribed by Reil and Herz. Emetics were recommended by Hufeland; and when the sulphate of zinc is used locally with honey or sirup of roses, a portion of it is sometimes swallowed and acts as an emetic. Absorbents were mainly relied on by Harris and Chalmers; and the mineral acids, chiefly the hydrochloric, by Grant and many others.

12. *B.* The *treatment* of aphtha should be *hygienic* and *medicinal*—local as well as constitutional or general. Unless *hygienic* measures be judiciously prescribed, the local and general medicinal treatment will generally be inefficacious. The *causes* which have produced the complaint ought to be removed as completely as possible, and the patient placed in a dry, temperate, and open situation in a well-aired apartment. Change of air is in most cases more or less beneficial. The nourishment should be prescribed with care; and if the child be still suckling, the milk and health of the nurse ought to be objects of particular attention. The age of the milk, the habits and functions of the nurse, and the state of her nipples, require examination. If the nurse have suckled long, or if she be intemperate, delicate, unhealthy, or cachectic; if the catamenia have been present, or if the nipples are sore, another nurse should be obtained. If the child is being or about to be weaned, it may be necessary to defer the weaning for some time, if the nurse be healthy; but if the complaint be then or at any other time attributable to the state of the milk, another nurse must be immediately sought for. If this intention cannot be accomplished, or if the child have been weaned, the disease having been occasioned by the change of nourishment, or by improper food, ass-milk or goat's milk, warm from the animal, should be given in quantity or states of dilution, which the peculiarities of the case, or the effects produced, will suggest.

13. *C.* The medicinal treatment, local and constitutional, must depend chiefly on the causes of the affection, on the age, strength, and circumstances of the patient, and on the history and complications of the case. In most instances of this disease, local as well as constitutional remedies are required, the former to correct or remove the local affection, the latter to improve the strength and the digestive and nutritive functions. Washes and lotions for the mouth, to be used by means of a piece of sponge firmly attached to a stick or whalebone, when the child is too young to rinse the mouth with them, are generally required; but the selection of these should depend much on the peculiarities of the case. The biborate of soda conjoined with honey is most commonly used. When the biborate is freely employed it readily cleans the mouth, separates the morbid exudation, and destroys the parasitic production that often appears; but if much of it be swallowed, it irritates the stomach and bowels. If these be already in a state of irritation, the local means which are least likely to increase that irritation or most likely to remove it ought to be prescribed. In such cases weak solutions of chloride of lime, or chlorinated soda, or chloride of zinc, may be used as now advised; or a solution of the nitrate of silver, applied by a pencil

* [The *Aphtha adultorum* of Bateman is a distinct disease from the above, being vesicular, and usually appearing on some of the same parts as the thrush of infants, particularly the edges of the tongue and fauces. If the vesicles be observed before the cuticle is ruptured, the fluid they contain is generally found more or less coloured with sanguineous discharge from the denuded cutis; but when they become broken, the collapsed cuticle exhibits a whitened appearance and adheres to the affected surface, thus exhibiting some resemblance to thrush. The diseased surface is very irritable and tender, and superficial sloughs, to which the cuticle becomes attached, are formed, which do not readily separate. A viscid, offensive discharge takes place, and often excites considerable nausea or vomiting.]

or sponge, as already recommended; or mucilage, or honey, or sirup of roses containing diluted sulphurous or muriatic acid, may be employed in a similar manner. The chief objection to these latter is, that when they are swallowed in any considerable quantity they often occasion severe griping pains, or increase existing disorder of the bowels. Dilute pyroligneous acid with minute doses of creasote may be tried in the same way as the preceding, or lemon juice may be substituted for the acid. Dr. JENNER has recently recommended the solution of a drachm of the sulphite of soda in an ounce of water, as a wash for the mouth when the parasitic formations are developed. Many years ago I generally directed at the Infirmary for children a confection composed of powdered liquorice root, honey, and a small proportion (about ½ to ¼) of spirits of turpentine; and my experience has convinced me of its superiority over other means in the larger number of cases.

14. Various other washes or gargles for the mouth have been advised and are very commonly used, especially solutions of borax with tincture of myrrh, honey, or sirup of roses; or the solution of alum in the infusion of roses, with tincture of krameria or catechu and a small quantity of tincture of opium. If the bowels become much relaxed, the cretaceous mixtures, with the compound tincture of camphor and the tincture of krameria or catechu, and aromatic confection; the warm bath or semicupium, salt or mustard being added to the water, are commonly of service. If the powers of life are much depressed, warm stimulants should be added to whatever other means may be required. Of these the most beneficial are the carbonate and aromatic spirit of ammonia, camphor, capsicum, tincture of cinnamon, or of arnica, or of cascarilla, &c.; and one or more of these may be selected. If the bowels be constipated, magnesia and sulphur, rendered palatable with ginger and liquorice powder, may be prescribed, either with or without rhubarb, according to circumstances.

15. In all cases of thrush, the *hygienic* treatment ought to receive especial attention. The food of the child should be selected with care, and the effects of each particular article of diet carefully observed, in respect of the functions of digestion and defecation. The other means already noticed under this head (§ 12) should receive no less attention; for the use of detergent, astringent, or antiseptic applications, as above advised, ought never to supersede hygienic measures, the restorative, tonic, and febrifuge remedies, and even the more active stimulants, which are often indicated in both the more simple and the complicated forms of this disease.

[*Aphthæ* should be regarded as one of the varieties of *stomatitis*, which assumes various forms, according to the nature, degree, and seat of the inflammatory action; as *erythematic with altered secretion* (*muguet*), *follicular* (*aphthæ*), *ulcerous*, *gangrenous* (*cancrum oris*).

The *erythematic* variety to which new-born infants are so liable, from the naturally congested state of the buccal mucous membrane, is characterized by redness, heat, and sometimes dryness of the mouth and tongue. It is the first degree, or primary symptom, of the other varieties of stomatitis; varying much in intensity and duration; often accompanying inflammation of the stomach and bowels, rarely giving rise to any febrile derangement in very young infants. The inflammation may be confined to one part of the mouth, or occupy the entire cavity, sometimes spreading to the lips, causing them to tumefy, excoriate, or become the seat of *herpes labialis*. It generally yields readily to emollient gargles, milk diet, and a little magnesia.

Stomatitis, with altered secretion, or *muguet*, is sometimes confounded with aphthæ, from which, however, it is quite distinct. True *muguet* is characterized by a concretion of mucus on the surface of inflamed mucous membranes, as in the mouth, œsophagus, stomach, and small or large intestines. It occurs under three forms: 1st, in the form of very *small* white points, dispersed over the tongue and sides of the mouth; 2d, of various-sized shreds; and, 3d, of a distinct membrane covering the tongue or sides of the mouth. In all these forms, the appearances are owing to an erythematic inflammation of the surface of the tongue, or buccal parietes, and the preceding varieties are owing to the degree of inflammatory action present. The slightest grade produces the small white points; as it increases in severity, these points coalesce, and form small laminæ either on the surface of the tongue, or of the lips and cheeks. These layers may thicken, exfoliate and detach themselves, leaving an inflamed surface, which soon secretes materials for a new concretion, which will be renewed as long as the inflammation lasts. This last form is called *confluent* or *malignant muguet*. The pointed variety usually occupies the extremity and edges of the tongue, the second appears on the internal surface of the lips and cheek; while the membraniform occurs at the base of the tongue and on the velum. This affection is almost confined to early infancy, and is extremely apt to occur wherever children are crowded together, in badly ventilated places, and nourished with unsuitable food. It is not confined to any particular season of the year, as proved by observations made by BILLARD at the Foundling Hospital of Paris, where on an average more than one fourth of the children suffer an attack of it. There is no reason to suppose it contagious. It is attended with more or less heat and dryness of skin and thirst, though the pulse is rarely excited. It is sometimes complicated with other phlegmasiæ, as of the digestive organs, skin, lungs, and cerebro-spinal apparatus.

Follicular stomatitis, or *aphthæ*, consists essentially in an inflammation of the muciparous follicles of the mouth, which in the healthy state are invisible, but when inflamed assume the form of small white or red points, with sometimes a prominent coloured spot in the centre, and surrounded by a slight inflammatory circle. Like the former varieties, this disease exists in different grades of intensity, from slight enlargement of the follicles, which pour out a white puriform matter, to ulceration of the same. The follicle, when broken, presents a superficial ulcer, with circular elevated borders, and surrounded by a red inflammatory circle; and from it a white pultaceous matter is secreted, which may adhere in the form of a scab, or be detached and ejected with the saliva.

These *aphthæ* may be isolated, as on the internal surface of the lower lip, the frenum of the tongue, the internal surface of the cheeks, &c.; and if they are numerous, they coalesce, and the curdy matter which is poured out forms a con-

tinuous coat of greater or less extent and thickness. It is this appearance which has caused this form of disease to be confounded with *muguet*, in which there is no solution of continuity, and no development of the follicles. Sometimes a brown scab is formed by the secretion being mixed with a small quantity of blood, which is often mistaken for a gangrenous eschar, though the inflammation may rarely terminate in true gangrene; after cicatrization has taken place, scarcely any trace of the ulcer can be seen.

This disease is not, like *muguet*, peculiar to infants, but may occur at any period of life. It is generally, however, met with in feeble, pale, and leucophlegmatic children, and under the same circumstances as predispose to *muguet*—bad nutrition, vitiated air, crowding, &c. While the latter occurs among newly-born children, *aphthæ* are more frequently met with among those who are teething, and its chief exciting cause, no doubt, lies in the anatomical development and increased vital energy of the follicular apparatus at this period.

The constitutional symptoms are usually slight, the pulse is scarcely affected, and there is not much febrile excitement, unless in children a little advanced in age. If the disease, however, extends to the stomach, the child grows pale and thin, is affected with diarrhœa and frequent attacks of vomiting, or acid eructations, and regurgitations of the milk, while the child is wakeful and restless.

The treatment of this form of disease is very simple — a mixture of cream and the white of egg, or powdered gum arabic, placed in the mouth, or a piece of lint dipped in a decoction of flax-seed or slippery-elm, marsh-mallows, barley-water, or milk and water—always attending particularly to the best hygienic conditions.

The above measures, with suitable nourishment and gentle laxatives, will be all that is necessary in the mild form of the disease; but when the aphthæ become confluent, acidulated gargles or slightly stimulating applications may be substituted with advantage, as a mixture of barley-water sweetened with honey, to which a few drops of sulphuric acid have been added; equal parts of finely powdered borax or alum and white sugar; a wash of decoction of cinchona or oak-bark, and in severe cases chloride of soda in the proportion of ʒss. to ʒiij. of water.

The other forms of stomatitis are, 1st. *The Ulcerous*; 2d. *The Pustular*, and, 3d. *The Gangrenous*. The first, the result of ordinary inflammation, and occupying indifferently every part of the buccal cavity; the second developed only during the progress of small-pox; and the third being the termination of any of the preceding kinds of stomatitis already described, but which is more particularly treated of under that head.]

Bibliog. and Refer.—*Celsus*, lib. vi., cap. 11.—*Paulus Æginetus*, lib. i., cap. 10; lib. iii., cap. 26.—*Ætius*. Tetrab. i., serm. iv., cap. 15; Tetrab. ii., ser. iv., cap. 39.—*Actuarius*, Method. Med., lib. ii., cap. 10; iv., cap. 14.—*Avicenna*, lib. iii., cent. vi., cap. 22.—*Ballonius*, Consil. i., p. 34; iii., p. 100.—*V. Ketelaer*, Comment. Medicus de Aphthis nostratibus, seu Belgarum *Sprouw*, 12mo. Lugd. Bat., 1672.—*Riverius*, Observat., &c., cent. ii., 43; cent. iii., 35.—*Amatus Lusitanus*, Curat., cent. i., No. 17.—*Sennert*, Pract., &c., lib. ii., cap. 18, p. 271.—*Riedlin*, Lin. Med. 1700, p. 249. (*Extending to the Stomach and Bowels.*)—*Thilenius*, Med. und Chirurg. Bemerkungen, b. ii., p. 73. (*Sulphate of Zinc.*)—*Boerhaave*, Aphorism. sect. 979, *et seq.*—*Van Swieten*, Comment. ad Boerhaave Aphor., t. iii., p. 197.—*Rosen*, Traité des Mal. des Enf., cap. ix.—*Sauvages*, Nosolog. Méth., t. i., p. 455.—*Colombier*, in Hist. de la Soc. Roy. de Méd., 1779, p. 186.—*Auvity*, in Mém., &c., 1787 et 1788, p. 148. (*Infectious.*)—*J. C. Stark*, Abhandlung von den Schwämmchen, 8vo. Jena, 1784.—*Meza*, in Acta Haun., ii., p. 117.—*Lentin*, Beyträge, &c., 246. (*Contagious.*)—*Auvity*, in Mém. de la Soc. Roy. de Médecine, 1787-88.—*Sidren*, in Nov. Act. Soc. Upsal, iii., p. 36. (*Esse papulæ non ulcera.*)—*M. Stoll*, Prælect., ii., p. 436, et Ratio Medendi, ii., p. 167.—*Harris*, De Morbis acutis Infantum, p. 29.—*I. F. S. Posewitz*, Semeiologia Aphtharum. Witteb., 1790.—*F. Double*, in Journ. Génér. de Méd., t. xviii., 1803, p. 13.—*Reil*, Memorab. Clinica, fasc. ii., p. 14.—*M. Baillie*, Series of Engravings, &c., fasc. ii., tab. 2.—*J. Pison*, Dissertat. sur les Aphthes des Nouveaux-nés, 4to. Paris, 1806.—*Wolff*, in Hufeland u. Himley, Journ. der Prac. Heilk., 1810, p. 114.—*Veron*, Observat. sur les Mal. des Enfans, 8vo. Paris, 1825; Rev. Méd., t. iii., 1825, p. 318. Archives Génér. de Méd., t. ix., p. 291.—*Lélut*, in Ibid., t. xiii., p. 335, et in Répertoire d'Anat. Patholog., t. iii., p. 143.—*Guersent et Devillers*, in Dict. de Médecine, Articles *Aphthes* et *Muguet*.—*A. Henke*, Handb. zur Erkenntniss und Heilung der Kinderkrankheiten, 2 vols. 8vo. Francf., 1821.—*Heyfelder*, Beobacht. ueber die Krankheiten der Neugebornen, &c., 8vo. Leipz., 1824; et in Enclop. Wörterb., art. *Aphtha*, b. iii. Berl., 1829.—*Guyot*, in Nouv. Biblioth. Méd., Ann. 1829, t. iii., p. 53.—*C. Billard*, Traité des Maladies des Enfans Nouveaux-nés, 8vo. Paris, 1828.—*Godinat*, Du Muguet chez les Nouveaux-nés. Paris, 1834.—*Denis*, Rech. d'Anat. et de Physiol. Pathol. sur Mal. des Enfans, &c., 8vo. Paris, 1834.—*A. Robertson*, Cyclop. of Pract. Med., vol. i., art. *Aphthæ*. Lond., 1832.—*Valleix*, Clinique des Mal. des Enfans Nouveaux-nés, 8vo. Paris, 1838.—*Denis*, Recherches Patholog. sur plusieurs Maladies des Enfans Nouveaux-nés, 8vo, 1836, p. 106.—*C. Robin*, Histoire Naturelle de Végétaux Parasites qui croissent sur l'Homme, et sur les Animaux vivants, avec planches, &c., 8vo. Paris, 1853.—*Jenner*, in Med. Times and Gazette, 1853.

[Amer. Bibl. and Refer.—*James Stewart*, A practical Treat. on the Dis. of Children, 8vo. N. Y., 1845; also Trans. of Billard of Dis. of Infants, 8vo. Phil., 1850.—*Coates*, in N. A. Med. and Phys. Jour., 1826.—*John Bell*, Am. ed. of Michael Underwood's Treat. on the Dis. of Children, 8vo; Phil. and Lectures on Prac. of Physic, 2 vols.—*D. F. Condie*, A Treatise on Dis. of Children, and Am. ed. of Evanson & Maunsen's Practical Treat. on the Dis. and Management of Children, 8vo. Phil.—*W. W. Gerhard*, Graves & Gerhard's Clinical Lectures, 8vo. Phil.—*C. D. Meigs*, On Diseases of young Children, 8vo. Phil., 1850.—*Robley Dunglison*, The Pract. of Med., 2 vols. 8vo. Phil.—*J. Eberle*, A Treatise on the Dis. and Phys. Education of Children, 8vo.—*J. Bigelow* and *O. W. Holmes*, Amer. edit. of Marshall Hall's Principles of the Theo. and Prac. of Med., 8vo. Boston.—*J. Thacher*, Am. Med. Prac., 8vo.—*W. P. Dewees*, A Treat. on the Phys. and Med. Treat. of Children, 8vo. Phil.—*A. S. Doane*, Am. ed. of Good's Study of Med., 2 vols. N. Y.—*J. B. Beck*, Essays on Infant Therapeutics, 8vo. N. Y.]

TINEA.—Synon.—*Tinea capitis.* Αχωρ, Græc. *Favus*, Lat. *Porrigo*, Celsus, Pliny, Willan. *Tinea*, Sennert, Sagar, Sauvages, Cullen. *Phlysis porrigo*, Young. *Ecpyesis porrigo*, Good. *Crusta lactea*, *Impetigo*, Auct. *Kleien kleiengrind*, Germ. *Teigne*, *Gourme*, Fr. *Tetter*, *Scall*, *Scalled-head*, *Ringworm*.

Classif.—*See* Skin—*Classification of its Diseases.*

1. Definit.—*A specific chronic disease affecting chiefly the hair follicles, where specific parasitic plants are developed, and which are capable of communicating the disease to parts susceptible of the infection.*

2. M. Bosquillon supposes that the term *Tinea** was used for the first time by Etienne, of

* [The word *tinea*, according to Lovey, is a barbarous term, introduced by the writers of the Middle Ages, and is supposed to be derived from the words *sahafaté* and *alo-athim* of the Arabians. Under these names Avicenna described an ulcerating and crustaceous disease of the hairy scribed an ulcerating and crustaceous disease of the hairy scalp, of which he admitted two species, the one moist (*pseudo-tinea*) and the other dry (*favus*, of the moderns). From the Arabian words above alluded to, the commentators and Latin translators have, by abbreviation and corruption, been able to forge the terms *thius*, *thineum*, and *tineam*. Mercurialis, however, states that the name *tinea* has been given to the malady in consequence of the ravages which it makes on the hairy scalp, similar to those which the insect bearing the same appellation, *tinea* (*moth*), produces in clothes.—*Ed.*]

Antioch, who, in 1127, translated the works of Haly Habbas. It was afterward adopted by Guy de Chauliac, and long subsequently employed by Ambrose Paré. But from the earliest use of the term, the greatest diversity of opinion existed as to the varieties or forms which the disease presented. Guy de Chauliac recognised five forms of Tinea, which term was used synonymously with *porrigo*; viz., *T. favosa, ficosa, amedosa, uberosa*, and *lupinosa*. Ambrose Paré described three varieties; *T. porriginosa, ficosa*, and *corrodans*. Much more recently Alibert admitted five species of the disease; namely, the *mucous, furfuraceous, amiantaceous, granular*, and *favous*. Willan described six species under the genus *Porrigo; larvalis, furfuracea, lupinosa, scutulata, decalvans*, and *favosa*. It is obvious that those as well as other writers comprised under the generic term Tinea or Porrigo several eruptions of the scalp which actually were varieties of different diseases. Thus the *Porrigo larvalis* of Willan corresponds with the *Achor mucosus* of Alibert, a variety of *impetigo*. The *Porrigo favosa* is a true *impetigo* of the scalp, and is the same as the *granular tinea* of Alibert. The *Porrigo furfuracea* of Willan is the *Tinea furfuracea* of Alibert, and is merely *Pityriasis capitis*; the *Tinea amiantacea* of this latter writer being only a more chronic and severe form of the same affection. Thus several varieties of *Eczema, Impetigo*, and *Pityriasis* have been arranged under *Tinea*, or its synonym *Porrigo*.

3. It has been recently shown by Bazin, and farther illustrated by Dr. Jenner, that several affections of the scalp are connected with the development of parasitic microscopic plants. These affections are obstinate, contagious, seated chiefly in the hair follicles, have a tendency to spread in circles, and hence have been popularly called ringworm. M. Bazin and Dr. Jenner have included under the genus *Tinea* those affections which are attended, kept up, or produced by the development of minute parasitic plants or spores; namely, *Tinea favosa, T. tonsurans, T. decalvans*, and *T. sycosa*. Of these four species, three only will be considered at this place; the fourth, or *Tinea sycosa*—the *Mentagra* of Willan and Bateman, the *Sycosis* of numerous writers—has been described under this latter appellation. (See *art.* Sycosis).

4. i. Description.—*A. Tinea favosa, Porrigo favosa* of Willan and Bateman; *Favus* of Drs. A. T. Thomson, Simon, and others. This disease most frequently appears on the hairy scalp, but sometimes on other parts of the body. It is characterized by dry, thick yellow crusts, which are, when small, circular, depressed in their centres, and somewhat cup-shaped. A hair is generally seen passing through the centre of each crust. Some of the crusts are generally very small, while others have a diameter of one third of an inch, or even upward. The larger appear in many instances as if formed in concentric rings, alternately yellow and brown, and have an irregular shape or outline, still, however, indicating their origin from distinct centres. The large, irregularly-shaped crusts are pitted on the surface, and, from their resemblance—often, however, very slight—to the divided surface of a piece of honeycomb, the disease has been named favus. The margins of the larger crusts are considerably above the level of the surface; while the centres seem somewhat sunk into the substance of the cutis. Upon carefully detaching the crusts from the surface a distinct layer of epithelium is found beneath them, while a careful examination of the smaller crusts shows a layer of epithelium covering them. The crusts of Tinea favosa are remarkable for their thickness, dryness, brittleness, and depressed centres. It is not a pustular disease, but it is sometimes consecutive upon eczema, impetigo, chronic lichen, and herpes circinatus; and pustules are occasionally or sometimes formed subsequently to Tinea favosa, owing to the irritation produced by the morbid exudation, and by scratching.

5. The hair, even at an early period of the disease, may be easily pulled out from the centre of each little crust. It subsequently falls out of the diseased parts, and permanent baldness of those parts results. When the disease is developed, or any considerable extent of surface is affected, a peculiar offensive odour, which has been variously described, is generally perceived. This was noticed by John of Gaddesden,* in his *Rosa Anglica*, where he gives the following definition of Tinea: "Tinea est scabies capitis, cum squamis, crustis, pilorum evulsione, colore et odore fœdo, et aspectu abominabili."

6. The parasitic plant, detected by the aid of the microscope, is different in species, and in the precise situation occupied by it in the several species of the disease. In *Tinea favosa*, as described by Gruby, Bazin, Robin, and Jenner, the cryptogamic parasite is the *Achorion Schönleinii*. "This plant has mycelium, sporule-bearing branches, and sporules. The sporules are round or oval, and their diameter varies, according to Gruby, from 0·003mm. to 0·01mm. The vegetable growth is first perceptible between the layers of epithelium, just at the orifice of the hair follicle; from this point it may spread downward between the hair and its capsule, and upward around and in the substance even of the hair." —Jenner.

7. *B. Tinea tonsurans—Porrigo scutulata* of Willan, Bateman, and A. T. Thomson; *Herpes tonsurans* of Cazenave and *Trichinosis furfuracea* by Wilson—is often mistaken for *Herpes circinatus* of the scalp, with which, however, it is sometimes associated. It is characterized by pallor of the affected part, and by decolorization and brittleness of the hairs. Thin, white, powdery scales surround the bases of the hairs, and cover the skin between them. The affected hairs somewhat resemble "tow," and are remarkable for their bent and twisted shape, and resemblance to the fibres of hemp in colour and appearance. They are sometimes so brittle, that every hair in the affected spot is broken off close to the surface. The diseased patches are generally circular. Crusts form on the patches of Tinea tonsurans only when, from neglect, from scratching, or from the application of irritants, they become inflamed.

The parasite in this species of the disease is the *Trycophyton tonsurans*, "and is composed of spores only; the spores, however, are occasionally somewhat elongated and arranged in a linear series. They are round or oval, and their diameter varies from 0·003mm. to 0·01mm. The primary seat of this parasite is the root of the hair. Subsequently it extends up into the substance of

* He admits the contagious nature of the disease, and supposes it to be caused by depraved humours and bad food, and by transmission from the parents or nurse.

the hair, and even outward, according to Bazin, on to the skin between the hairs."—Jenner. The spores may be at first confined to the hair follicle. But Bazin and Robin have described and delineated them between the fibres of the hair, which they had split up.

8. *C. Tinea decalvans—Porrigo decalvens* of Willan and Bateman; *Vitiligo of the Scalp* of Cazenave—is charaterized by the falling out of the hair rapidly, from one or more circular spots, leaving a smooth bald surface, without crusts, scales, or eruption of any kind. When the bald surface is large, it becomes more irregularly shaped, with scalloped edges, and a tendency to preserve the circular form. The disease may spread over the greater part or the whole of the scalp.

9. In *Tinea decalvans* the parasitic formation is the *Microsporon Audonini*. "This plant is formed of branched filaments, on which the spores are developed. The spores are very small, from 0·001mm. to 0·005mm. The seat of the growth is the outside of the hair, and it forms a sort of sheath around the hair, from the surface of the skin, upward, from 1mm. to 3mm. Gruby first described this plant, and its relation to Tinea decalvans; and Robin says he can confirm the accuracy of Gruby's description."—Jenner.

10. *D.* For *Tinea sycosa*, see *art.* Sycosis. These *four species* of Tinea are especially *characterized* as follows: Tinea favosa is remarkable for its crusts; Tinea tonsurans for the discoloration and brittleness of the hair; Tinea decalvans from baldness not preceded nor attended by an eruption; and Tinea sycosa from inflammation, tenderness, hardness, and suppuration of the hair follicles.

12. ii. Causes.—It has not been decidedly shown whether or no the parasitic formations detected in these species of tinea are the actual causes of them, or whether they are formed in the course of the disease. Those who espouse the former alternative believe that the spores of these parasitic plants are given off, float in the air, and infect those who are exposed to them. Still they admit that these spores require for their growth a peculiar nidus. Dr. Jenner contends that, as all persons who mix with children affected with tinea do not receive the disease, a soil favourable to the growth of the spores previously exists, so that when a spore is conveyed to that soil it is developed and forms other spores, and so spreads and propagates. Remak applied the crusts of favus to his arm, and having removed them after a time, his skin appeared perfectly healthy; and it was not until a fortnight after that his arm had become diseased. Still this experiment does not prove that the spores contained in the crusts produced the infection, but that the morbid secretion forming the crusts infected the parts to which it was applied, and that the hair follicles, thus becoming diseased, furnished the secretion in which the parasites were developed; and hence the experiment of Remak favours the latter alternative rather than the former; viz., that the morbid secretions of the crusts having infected the hair follicles, parasitic cryptogamic formations were developed in the secretion lodged between the layers of epithelium and between the hair follicles and the roots and fibres of the hair. Those who believe that the conveyance of the spores from the developed disease to a soil suited to their growth, admit that the soil exists, and consists of an already morbid state of the hair follicles, caused by debility, scrofula, neglect of cleanliness; and that many persons, especially those thus predisposed, "have in their hair follicles a secretion suited to be the nidus of this plant." But this admission is in truth what I contend for; namely, that the disease, owing either to the strumous diathesis, to constitutional or local debility, to uncleanliness, to the lodgment of foul matter, or to the contact of contagious secretions, supervenes in the hair follicles, and the morbid secretion in these follicles produces, according to its especial nature or character, a parasitic formation peculiar to each species of the disease. Thus the parasite is consecutive of disease of the follicle, and not the agent by which the disease is propagated. Dr. Jenner almost admits this while he contends for the agency of the spores, by remarking that "the patient suffering from tinea comes under our care for the perceptible disease, and will be well contented if we can cure him of that; but it would be better if we could also destroy the susceptibility to the disease—if we could bring the hair follicles into a state in which they no longer secrete a nidus in which the plant can grow." The truth appears to be, that in this disease, as well as in others, where a morbid secretion is produced in states of great general or local debility, and where these secretions remain long in contact with the surface producing it, and protected in these situations, parasitic formations of low grades of vitality and development take place, the morbid secretions forming the material of growth, and the vitality emanating from the diseased part, imparting to these materials the organization which they present.

13. iii. Treatment.—General and local debility, a scrofulous diathesis, and want of cleanliness predisposing to, if not of themselves producing, the disease, contagion being an efficient or exciting cause in many if not in all instances, the contagious agent being, moreover, either the spores of the parasitic plants noticed above, or the secretion of the affected parts, the *indications of cure* are quite apparent. These are, 1st, to strictly observe general and local cleanliness; 2d, to improve the state of the constitution; and, 3d, to remove the local affection. These intentions may be fulfilled contemporaneously. But in many cases, especially of the *second* and *third species*, none of the predisposing causes just mentioned may exist; there may be neither debility, nor the scrofulous diathesis, nor want of cleanliness, and yet the disease is present. Contagion or infection may be inferred without sufficient proof, even although the parasitic formations are detected by the aid of the microscope; for it may as reasonably be concluded that the disease has occurred sporadically, owing to debility or other morbid condition of the hair follicles, the secretion of these follicles giving origin to the parasitic formations in the manner above stated (§ 6, *et seq.*).—*A.* In most instances, especially where the conditions, often favouring the several species of the disease, are present, frequent ablutions and poultices, in order to remove the crusts; tonics and alteratives, aided by the usual hygienic measures, change of air, exercise, and suitable diet, are requisite. But, at the same time, *local means* are indispensable, especially such as may restore the hair follicles to a healthy state, and destroy the parasitic formations, to which more than due

importance has been imputed since their discovery by microscopic observers. These means are remarkably numerous, but most of them are only occasionally efficacious, comparatively few being even generally successful.

14. *a.* While constitutional treatment is being employed, the local means most to be relied upon should be strenuously continued. The hair ought to be cut close; the crusts of favus softened and removed by linseed or bread and water poultices, and by ablutions with strong soft soap, and the scalp covered by an oiled silk cap. These preliminary measures are always necessary. After these, the local remedies most to be confided in should be prescribed. But, before I notice the substances that have been more recently recommended, I shall enumerate those which had previously been prescribed, and more or less confided in. These latter have generally been employed in the form of *ointments*, of *lotions*, or *washes*, or *plasters*. The *first* of these, whatever may be the active ingredient, should be washed off by means of soap and water, or any alkaline or detergent lotion, after having been applied for some hours, and immediately afterward renewed; for ointments often become more or less rancid and irritant when they have been long applied. Most of the fluid applications or lotions, whether solutions, dilutions, decoctions, or infusions, require to be applied for some time to the affected part, by means of lint, especially if the crusts have not been entirely removed, and the hair of the diseased follicles is still remaining. *Washes* may be selected with the double intention of cleansing the surface and curing the disease; this latter object being attained either by destroying the parasitic plant or by removing the morbid condition producing the parasite, or by this combined action. *Plasters* may be employed, after the hair has been cut off close to the surface, with the object either of removing the diseased hair, or of curing the affection, or of fulfilling both intentions.

15. *b.* The *ointments* prescribed for this complaint after the crusts have been removed, have often failed. Those containing *mercury* in some form or other, although advised by very eminent physicians, have not only frequently failed, but have sometimes been injurious, especially when their effects have not been carefully watched. Ointments containing calomel are praised by Hildebrandt and others. Those with the white precipitate, or with the nitrate, have been employed by Purmann, Vogel, Lentin, Murray, and Ring. *Sulphur* ointment, or the balsam of sulphur, in the form of an ointment, has been recommended by Ruland, Hamilton, Barton, and Alibert. Ointments containing the *sulphate of copper* have been prescribed by Thomann, Desault, Duncan, and Starke; that with *muriate of barytes*, by Hufeland; with *cantharides*, by Wendt; with common *soot*, by Pelargus, Thomann, and Niemann; with *conium*, by Quarin, Stoerck, Murray, Stoeller, and Hufeland; with *tar*, by Van der Haar; and with *empyreumatic oil*, by Zacutus Lusitanus and Rudolphi. The *unguentum Jasseri*, which consists of the sulphate of zinc and sulpur, is praised by Schack. It was formerly in great repute in Germany for the cure of this affection. Ointments with the *balsam of Peru* and *tincture of Lytta*, have very often been prescribed by the author for the second and third species of the disease with success.

16. *c. Lotions* and *washes* have been as generally used in tinea as ointments. Dilutions of the *acids* have been advised by many—of the *nitric acid*, by Colla and Tomasini; of *muriatic acid*, by Thilenius, Plenk, and Brinckmann; of *sulphuric acid*, by Agricola and others; and the pyroligneous *acetic acid*, either alone or with creasote, by myself. Solutions of the *bi-chloride of mercury*, either in dilute alcohol, or in water with the muriate of ammonia, have been employed by Zacutus Lusitanus, Bell, Duncan, and others, but they may be injurious. Solutions of *borax*, either in distilled water or in diluted acetic acid and tincture of myrrh, have been prescribed by the author. Besides the above, solutions of the *nitrate of silver*, of the sub-carbonates of the *alkalies*, of the sulphate of *copper*, of the sulphate of *zinc*, of the sulphate of *iron*, of the *sulphuret of potass*, and of the *arseniate of potass*, have been severally employed by numerous authorities; while decoctions, infusions, &c., of *tobacco* and of various narcotic plants, have been advised by many writers. The *Ledum palustre* was used by Linnæus, and the *Tussilago farfara* by Meyer and Hufeland.

17. The use of *tan-water*, as either a lotion or wash, after the removal of the crusts of favus, is favourably mentioned by Weaver. I have, in similar forms and circumstances, employed strong *tar-water* with complete success.

18. Other substances have been prescribed for this complaint, either in the form of ointment or in a fluid state, as a lotion or wash, as the peculiarities of the case suggested. Of these the most important are *arsenic* and *tobacco*. My own observation has proved that these may be most dangerous when applied to a large surface after the crusts of favus have been removed, especially when incautiously used in a fluid state, or when ointments containing either have been too long applied or too frequently renewed. Justamond witnessed a case in which the use of a decoction of tobacco was fatal; and I have seen an instance in which arsenic applied to the scalp after the removal of the crusts of favus very nearly produced a fatal result. *Tartar emetic* has been advised by Blizard, and employed in the form of ointment and lotion; but it may be also injurious, if not carefully watched, and it is by no means of great service at any period of the disease.

19. *d. Plasters* of common *pitch*, or *Burgundy pitch*, have been employed with the object of removing the hair from the diseased follicles, and of restoring the follicles to a healthy state. *Ammoniacum*, made into a plaster with acetic acid, and applied after the crusts have been removed, has been prescribed with the same intentions as the pitch. Tar ointment, or tar mixed with melted suet, has been similarly used. *Tar* applied simply over the affected part, after the crusts and diseased hair have been detached, and covered by oiled silk, very seldom fails of success, especially if tar or pitch pills be given internally during the treatment.

20. More recently the preparations of *iodine* have been frequently prescribed, both in this disease and in several others of those which I have arranged under the order *Dermatites contagiosæ* (see *art.* Skin, § 76). As early as 1825, Mr. Morson prepared for me an *iodide of sulphur*, which I prescribed in the form of ointment (from ℈j. to ʒj. in ʒj.) in cases of tinea and psora, chiefly at the Infirmary for Children. About the

same time and subsequently, I frequently employed the tincture of iodine somewhat diluted, or the iodurated solution of the *iodide of potash*. These preparations were generally successful, especially if the preliminary part of the treatment was duly attended to (§ 13, 14). I have also employed various combinations of camphor, turpentine, and soap liniment after the removal of the incrustations; or the former of these with lime-water.

21. *B.* When favus is seated on the trunk or extremities, it may be easily cured by these means, or even by alkaline, or sulphurous baths, or by frequent ablution with strong soft soap after the incrustations are removed by poultices. But when it is seated in the scalp, then most of the means above noticed may fail, or at least require a protracted use, if the diseased hair be not removed. *Evulsion of the hair* was long ago directed by Astruc, Acrel, Fischer, Van der Haar, Morison, Lamotte, Sedillot, and Plumbe; and more recently by the Messrs. Mahon of Paris, who facilitated and accelerated this intention by a depilatory powder, the composition of which they kept secret. The method formerly employed of extirpating diseased hair was by applying straps of plaster, variously prepared with pitch, ammoniacum, or other gums, after the removal of the incrustations, and by removing these straps forcibly after a day or two. Dr. Willis has justly remarked that any plan of treatment which combines the removal of the hair by gentle means, or when it has been loosened at its roots, with undeviating attention to cleanliness for about two months, will be found to cure favus.

22. Very recently, the local treatment of tinea has very satisfactorily been illustrated by Dr. Jenner, and in such a manner as to deserve particular notice and adoption. Professor Graham had suggested the use of *sulphurous acid* and the *sulphite of soda* for the destruction of parasitic formations. Dr. Jenner adopted the suggestion in the treatment of Tinea favosa; and it may be inferred that the means he has employed will be serviceable also in the other species of tinea. A solution of sulphurous acid is prepared, by passing a stream of the gas through water until the latter is saturated. Of this solution two ounces may be added to six ounces, to make a lotion, which may be used by means of lint, and frequently applied and kept wet for the removal of the crusts, and subsequently applied to keep the surface clean. Afterward zinc ointment may be prescribed to heal the surface left raw or sore by the previous application. I have seen great benefit obtained from washing the scalp occasionally, or frequently, with tar-water, or solutions of creasote, or with terebinthinate lotions. When the disease is seated on the trunk or extremities, the saturated solution of sulphurous acid may be abundantly added to a tepid bath, immersion being continued for about half an hour, and repeated after intervals of two or three days; a very few repetitions of the acid bath appears to remove the disease. This treatment deserves a trial in the second, third, and fourth species of tinea, as well as in several other chronic eruptions, and especially in all those which I have classed under the order *Dermatites contagiosæ* (see *art.* Skin, § 76, *et seq.*).

23. *C.* Most of the means above noticed may be employed for the *second and third species of tinea*, due attention being paid to the states of the hair and hair follicles; and the more stimulating applications, as the balsam of Peru, tincture of lytta, the essential oils, &c., being prescribed in pomades or ointments, after a due trial has been made of the sulphurous acid. After the acid has destroyed the parasite, these applications will be of service in restoring the functions of the hair follicles. (See *art.* Hair.)

[We have generally found most cases of this disease curable by removing the incrustations with soap and water, then plucking out the hairs by the roots with a forceps. Apply a solution of *sulphate of copper*, carefully removing the pus by soap and water daily. In a short time the purulent secretion will cease, and the cutis, assuming a red and shining appearance, soon becomes covered with hair. If the copper does not succeed, we resort to the *unguentum hydrargyri nitrati*, diluted with an equal quantity of simple cerate; or the *sulphuric acid* ointment. The *calomel* ointment (3j. to 3j. lard) we have also found very successful. In several obstinate cases we have succeeded in effecting a cure by first cleansing the head and removing the hair, as above, and then employing the *iodide of sulphur ointment*, made by mixing 16 grs. of *sulphur* with 3ij. of *iodine*, and slowly heating over a gentle fire until they are completely fused into one mass, and then made into an ointment in the proportion of 10 grs. to 3j. of lard, using it night and morning, and gradually increasing its strength from 3j. to 3j. Anodyne applications are necessary when the inflammation is attended with much irritability or pain. Constitutional treatment is not to be neglected, and the *cod-liver oil* will be found an admirable remedy, used both internally and externally.]

Bibliog. and Refer.—*Pliny*, l. xxviii., c. 14.—*John of Gaddesden*, Rosa Anglica, 2 vols. 4to. Ed., 1595.—*Guy de Chauliac*, Chirurgia, 4to. Lugd., 1585.—*Balloni*us, Consil. ii., 19; iii., 58.—*Zacutus Lucitanus*, Med. Pract. Hist., l. i., 3.—*Bonet*, Sepulchret, l. iv., sect. xii., 6.—*Mercurialis*, De Morb. Cutan., l. i., c. 10.—*Astruc*, De Tumoribus, p. i.—*Ruland*, Curat. Cent., v., 7.—*Raymond*, Des Mal. qu'il est dangereux de guérir. Avign., 1757.—*Murray*, in Doering Tract., t. i., p. 176.—*Schack*, in Mursinna Journ. für die Chirurgie, b. ii., p. 134.—*Plenk*, Beyträgen, ii., 5.—*Thilenius*, Medic. u. Chirurg. Bemerkungen, p. 293.—*Agricola*, Comment. in Poppium de Vitriolâ, p. 494.—*Lentin*, Beyträge, t. iv., p. 408.—*Thomann*, Annalen ad 1800, p. 134, et Annales Wurceburg, ii., 35.—*Colla and Tommasini*, in Giornale della Soc. Med. Chir. du Parma, t. i., art. 1.—*Barton*, in Journ. Gén. de Méd., t. xxvii., 237, et t. xxxv., p. 101.—*Bourdin*, in Ibid., t. xxxviii., p. 443.—*Hecker*, Annalen, 1810, p. 261.—*Gallot*, Recherches sur la Teigne, &c. Paris, 1802.—*Perès*, in Mém. de la Société Méd. d'Emulation, t. i., p. 230.—*Wegelin*, in Stark's Archives, b. vi., p. 271.—*Morison*, in Duncan's Ann. of Medicine, vol. ii., No. 3.—*Fischer*, in Richter Chirurg. Bibl., b. viii., p. 75.—*Sedillot*, in Journ. Génér. de Méd., t. xvi., p. 270.—*Blizard*, in Lond. Med. and Phys. Journ., vol. viii.—*Hufeland*, Von der Skrofelnkrankheiten, p. 278.—*Alibert*, Precis Theor. et Pract. de Mal. de la Peau, t. i., p. 3.—*Alibert and Plumbe*, Rev. of, on Tinea, in Medico-Chirurg. Review, vol. ii., p. 534.—*Crampton*, in Transact. of Irish Coll. of Phys., vol. iv., p. 69.—*F. W. Weaver*, in London Med. Repos., vol. v., p. 292. (*Tan-water as a cure of.*)—*Cooke*, A Pract. Treatise on Tinea Capitis contagiosa, 12mo. Lond., 1810.—*Luxmore*, Observ. on the Nature and Treatment of Tinea Capitis, or Scald Head, 12mo. London, 1812.—*Mahon*, Recherches sur le Siége et la Nature de Teignes, 8vo. Paris, 1829.—*N. Baudelocque*, Revue Médicale, t. iv., 1831.—*Dick*, Med. Gazette, 23 Decr., 1837, and Edin. Med. Journ., vol. iv., p. 536; Ibid., No. 118, p. 244.—*Gruby*, Mém. sur une Végétation qui constitute la vraie Teigne, dans Comptes rendus des Séances de l'Acad. des Sc., 1841, t. xiii., p. 72. Sur les Mycodermes qui constitut. la Teigne faveuse, Ibid., p. 309.—*A. Cazenave*, dans Ann. des Mal. de la Peau et de la Syphilis, t. i., p. 37. Paris, 1843.—*J. E. Erichsen*, A Practical Treatise on the Diseases of the Scalp, 8vo (with Plates). Lond., 1842.—*J. H. Bennett*, On the Inoculability of Tinea Favosa, in

Northern Journ. of Medicine, Sept., 1845.—*E. Wilson*, On Ringworm, its Causes, Pathology, and Treatment, 8vo. Lond., 1847.—*W. Jenner*, in Med. Times and Gazette, 20th Aug., 1853. (See also Biblioo. and Refer. to *arts.* Hair and Skin.)

[Am. Bib. and Ref.—See the American works referred to under the *art.* Thrush, and Bulkley's edit. of Cazenave and Schlegel.]

TONGUE—Diseases of the.—(Γλῶσσα, γλῶττα. *Lingua*, Lat. *Langue*, Fr. *Zunge*, Ger. *Lingua*, Ital. *Lengua*, Sp.)

1. Those slighter affections of the tongue which are symptomatic of either constitutional or visceral diseases, and which furnish more or less important indications of the seat, nature, and issue of disease, have been passed in review when treating of the symptoms and signs furnished by this organ in the article Symptomatology. (See § 101, *et seq.*)

2. I. Neuralgia of the Tongue.—Synon.—*Glossalgia* (from γλῶσσα and ἀλγέω, I pain). *Tic Douloureux of the Tongue.*

Classif.—*See* Neuralgic Affections.

3. *A.* Neuralgia of the tongue is not of frequent occurrence. I have seen only a few cases; and in these the pain was, without an exception, limited to one or other side of the organ. The pain presents nearly all the characteristics of neuralgia. It is sudden in its accession, most violent, often contracting the organ to the side affected, sometimes causing an abundant flow of saliva, and inducing sympathetically, more or less, contortion of the face. Its continuance may be momentary, its cessation being as sudden as its occurrence; or it may be more protracted, with more or less remission and violent exacerbation. The pain sometimes resembles the passage of a sharp instrument, or of a hot needle from the side of the base to the apex. The cases which I have seen were unattended by neuralgia of any other part, and I have viewed them as indicative of irritation either at the origin, or in the course of, the nerves supplying the side of the tongue affected; and as a not improbable precursor either of paralysis of the tongue, or of hemiplegia, or of apoplexy.

4. *B. The treatment* should be based upon the inferred states of the general and cerebral circulation, as respects either congestion, capillary action, or inflammation. If the neuralgic pain recur frequently, or prove obstinate or protracted, notwithstanding a due recourse to local depletions, especially cupping on the nape of the neck or over the mastoid processes, when general or local plethora or increased action exists; to purgatives and deobstruents, or to tonics, stimulants, and antispasmodics, with or without anodynes, when neither congestion nor inflammatory action is inferred, it will often be of service to pass a seton into the nape of the neck, and to preserve a free discharge from it. In some cases, especially when increased action or congestion exists, the shower-bath or the cold effusion on the head, while the feet are kept warm, or plunged in hot water, ought to be cautiously employed. The treatment in all respects should be the same as recommended in the article on Neuralgic Affections. (See § 79, *et seq.*)

5. II. Paralysis of the Tongue.—Classif.—See *art.* Palsy.

6. i. *Palsy* of the Tongue *is characterized by limited or impaired movements of the organ, and imperfect utterance, or entire loss of speech.* The loss of the power of motion of the tongue is generally unattended by the loss of sensation. The sense of taste is often not affected (Scarpa and myself). Paralysis of motion when primarily affecting the tongue is rarely so complete as to entirely prevent articulation. But after a stroke of apoplexy, or in connexion with hemiplegia or other paralytic states, the motions of the tongue are often so constrained or impaired as to affect articulation, more or less. When articulated sounds are altogether prevented, then the nerves of the tongue are not alone affected, but those also of the pharynx are more or less implicated, deglutition being also impaired, or very difficult. Paralysis of the tongue is most commonly observed at an advanced period of paralysis of a more or less general form, or after repeated attacks, especially of apoplexy, and is a very unfavourable sign. When thus appearing or associated, it is always attended by impaired or lost articulation, and is followed by difficult or lost deglutition; the patient, however, being often carried off by an apoplectic attack before this latter symptom occurs. Palsy of the tongue, in a more or less complete form, rarely precedes apoplexy or hemiplegia; but when it thus appears primarily, or before the occurrence of an apoplectic or hemiplegic seizure, it is always a very dangerous symptom, and most rarely exists long without a severe or fatal attack supervening. When it thus occurs primarily, it may or may not be accompanied by impaired or altogether lost deglutition. I have seen several cases of primary paralysis of the tongue, with complete loss of articulation, the first and most complete of these with Mr. Winstone. In these no other sign of disease was observed, and in all I inferred that severe or fatal apoplexy would occur in a short time; this result took place, and was rapidly followed by dissolution. In a case recently attended by Dr. N. Grant and myself, the paralysis of the tongue and pharynx disappeared upon an attack of gout in the feet. The slighter states of impaired movements of the tongue are, however, no infrequent precursors of apoplexy or palsy, and generally somewhat impair utterance or articulation.

7. ii. *The treatment* of palsy of the tongue is in many respects the same as described in the articles Apoplexy and Paralysis, and depends entirely upon the inferred pathological conditions—1st, of parts near the origins, or in the course of the lingual and pharyngeal nerves; 2d, of the blood-vessels and blood; 3d, of the organic nervous system; and, 4th, of the excreting viscera. If a gouty diathesis be inferred; or if gout have been previously experienced, sinapisms should be applied to the lower extremities; *Masticatories* and *Errhines* have been much recommended by Hautesierck and Lange; a *seton* or open *blisters* on the neck, by Helwig, &c., and active purgatives by Riedlin; but these are generally in use.

8. III. Inflammation of the Tongue.—Syn.—*Glossitis* (from γλῶσσα, the tongue).

Classif.—III. Class, I. Order (*see Author in Preface*).

9. Definit.—*Pain, great swelling and redness of the tongue, more frequently towards its base, and sometimes confined to one side of the organ, with more or less febrile action, the character of which varies with the cause and nature of the local disease.*

10. *Idiopathic and sthenic glossitis* is sometimes a very severe and even a dangerous disease. It is not, however, often met with in practice, al-

though the tongue is much exposed to the usual causes of inflammation. J. P. Frank saw but one case during a practice of twenty-five years, and during forty-five years he treated only seven cases. I have seen only four cases of this form of glossitis in thirty-five years. Of these, two terminated in suppuration; one only having thus terminated in the seven cases seen by Frank. The four which occurred in my practice either were limited to one side of the organ, or affected one side chiefly. The cases which were followed by abscess were limited to one side; and the inflammation in all the cases was chiefly seated in the thick part of the tongue. This immunity from the more usual sthenic form of inflammation may be ascribed partly to the muscular structure of, and partly to the abundant supply of nerves possessed by this organ.

11. i. Acute Glossitis. — *Sthenically acute Glossitis.*—This disease is readily recognised, as it comes directly before the senses of the physician. *It is characterized by redness, swelling, hardness: an acrid, stinging sense of heat, or a burning pain of the tongue, with either great dryness of the mouth, or a profuse flow of saliva, and the usual symptoms of inflammatory fever.* In proportion to the swelling are the functions of the organ impaired, and the voice, speech, and deglutition affected; the two latter being generally either nearly or altogether abolished in the most severe cases. Sometimes the tongue is swollen to such a size as to press upon the glottis, or rather to prevent the rising of the epiglottis, and to fill up the isthmus faucium and mouth, and threaten suffocation. In other cases, the swollen and inflamed tongue is protruded from the mouth. This, however, is oftener the case in the sympathetic glossitis proceeding from cynanche (see Throat, *Inflammation of*), and from the excessive use of mercury, when the simultaneous affection of the tonsils, parotids, and parts in the vicinity, and the consequent tumefaction of these, press the tongue outward.

[Dr. Salter has described one form of glossitis, which he calls *erectile*, in which the tongue becomes rapidly and enormously distended with blood, hard and stiff. The swelling is so great that respiration through the mouth is quite prevented, and can with difficulty be performed through the nostrils. Though the congestion becomes so intense that the organ is of a dark black colour, neither mortification nor abscess has been observed to occur. Free incisions give exit to the blood, and the patient recovers. Sometimes only one half of the tongue is affected. In most cases it occurs in persons who are in perfect health, and without any manifest exciting cause. —*Ed.*]

12. *A.* In some cases the attack is sudden; and in the most severe cases the tumefaction and the threatened suffocation are such as to place the patient's life in imminent danger. The surface of the tongue is generally covered by a thick mucous coating, or by an exudation of lymph. At the commencement of the disease the sense of taste is very acute, owing to the excited state of the nerves and increased vascularity of the papillæ; but, as the disease proceeds, taste is abolished, owing perhaps to the pressure experienced by the nervous fibrillæ from the turgid vessels, and fluid effused in the structure of the organ, and partly to the thick mucus or lymph covering the inflamed surface. To these are added unquenchable thirst, great anxiety and restlessness, headache, turgescence of the countenance, swelling and tenderness about the throat, and beneath the maxilla, watering of the eyes; sometimes anxious, pale, or saddened expression of countenance, quickened circulation, costive bowels, and high-coloured urine.

13. The *course* and *termination* of the disease are the same as of other inflammations. The malady usually proceeds as above, in a more or less severe form, and generally increases until the third, fifth, or seventh day, when it either subsides gradually under treatment, or terminates in resolution with critical phenomena, particularly profuse perspiration, hypostatic urine, or a copious discharge of saliva, or bleeding from the nose, or accession of the catamenia. If a favourable change does not take place at these periods, the disease may terminate in suppuration or in sphacelation; or it may occasion suffocation or apoplexy, neither suppuration nor gangrene having taken place, but these unfavourable results very rarely occur, unless the disease has been neglected.

14. *C. Abscess* seldom follows glossitis, owing to the muscular structure of the organ. I have seen only two cases in my practice, in which abscess occurred; and after a free opening was made the parts readily healed. Cases are recorded by Ebermajer, Frank, and others of this termination of the disease. Owing to the exudation of lymph into the substance of the organ, considerable hardness and enlargement sometimes remain long after the acute state of disease has been subdued. Hildenbrand supposes that this change may at last terminate in scirrhus or carcinoma; and in this opinion he appears to be supported by the observations of Loepler and Zeigler. I believe, however, that cancer very rarely or never supervenes upon sthenic forms of inflammation; malignant diseases of the tongue commencing in a slow and insidious form, and independently of antecedent acute disease. When acute glossitis goes on to suppuration, very serious consequences may result from neglect of this state. When the disease comes under treatment previously to the commencement of suppuration, this result may be prevented; or if it be inevitable, danger will be avoided, by a judicious and prompt method of cure; unless it take place in sympathetic glossitis, or in persons of a cachectic habit of body, or in cases caused by animal poisons taken into the mouth, or by the stings or bites of poisonous insects or reptiles.

15. ii. *Asthenic acute Glossitis.—A.* Inflammation of an acute asthenic character may take place either in a person whose constitution has been exhausted and his blood more or less altered, or in the advanced stage of a malignant febrile malady, as in exanthematous and pestilential diseases, or by the application of such animal poisons or deleterious matters as will be noticed in the sequel, to the tongue or mouth. This state of the disease, especially when occurring from these last-named causes, generally appears suddenly, and proceeds rapidly with great violence. The pain and tumefaction are very great, the inflamed parts being livid, or dark red, or brown, and the accompanying fever being characterized by vital depression, by a very quick weak or irritable pulse, and by signs of progressive contamination of the circulating fluids. Asthenic acute glossitis is seldom seen in a primary and uncomplicated form.

It is most frequently met with as a complication of scarlet fever, of small-pox, of erysipelas, and of pestilential maladies. When it occurs primarily, it may generally be inferred that some foul or poisonous substance has caused the attack. But whether appearing primarily or in the course of another malady, its diffusive nature is manifest. It often extends to the fauces, tonsils, pharynx, surrounding cellular tissue, and neck, more especially when it is caused by animal or other poisons, or by the sting of an insect.

16. *B. The course and termination.* of this form of the disease are generally rapid and unfavourable, unless very prompt and judicious means be employed. When it is caused by the contact or inoculation of poisonous matters, the local changes vary with the cause. These changes may consist of tumefaction, owing to the exudation of a dirty lymph or serum, or the affected parts may be livid, or otherwise discoloured, and more or less softened; or they may nearly approach a gangrenous state. In some cases the inoculated poison may so affect the organic nervous and vascular systems, and the blood, as to occasion death in a short time, the changes found in the tongue and adjoining parts being insufficient to account for this result.

17. iii. The Causes of acute idiopathic glossitis are chiefly poisonous, chemical, and mechanical agents. Animal poisons applied to the tongue, or animal matter in a state of disease or of decomposition, or the blood or the discharge from foul sores or malignant ulcers, the bites of insects, &c., produce the more severe and asthenic form of the disease. The incautious or accidental mastication of acrid and irritating substances, especially such as are poisonous, as briony or wild vine, the mandragora, the arum and other poisonous plants, have produced glossitis. I saw a case of the diffuse and asthenic form of the malady caused by monk's-hood accidentally masticated. Caustics, acids, and acrid chemical compounds, cauteries; hot and highly-seasoned articles of diet and stimulating drinks; mechanical injuries, as wounds, punctures, or bites during mastication or epileptic paroxysms, operations on the teeth, or for ranula; burns or scalds, the irritation produced by irregular or carious teeth, and the local action of irritating or stimulating substances introduced into the mouth during coma, have severally occasioned glossitis. I saw a case following the introduction of mustard into the mouth to produce vomiting in a case of poisoning by opium. The disease has sometimes been ascribed to the more common causes of inflammation, as exposure to cold in any form, draught of cold water or the use of ice, suppression of the perspiration or of accustomed discharges. Scheidemantel states that he saw glossitis follow exposure to cold; Starck from suppression of the menses, and hæmorrhoids; Wendt from suppressed perspiration of the feet; and Delatour from sudden suppression of epistaxis.

18. The above have been viewed as the chief *efficient causes* of this malady; but several of these may be considered as incapable of producing it, without the concurrence of others, either *favouring* or reinforcing them. The chief or most influential *pre*-disposing causes are, disorders of the prima via and digestive organs generally, especially those characterized by the accumulation of morbid secretions and mucous sordes; the gouty, rheumatic, and scrofulous diatheses; and inflammatory affections of neighbouring parts. Von Mertens, Kemme, Loefler, and others have too strongly insisted upon the occasional relations of these diseases to glossitis. In rare instances the disease has been said to have appeared immediately upon the subsidence of other inflammations. Thus Frank observed it after an attack of hepatitis; Dr. Elliotson saw it after bronchitis; but such occurrences may be viewed as hardly connected, or as mere contingencies.

19. iv. Symptomatic and Complicated Glossitis.—Inflammation may attack the tongue consecutively upon inflammation of adjoining parts, as of the tonsils, fauces, gums, and pharynx. This form of the disease not infrequently occurs from excessive mercurial action of the salivary glands, which in some constitutions may be induced by a very small dose of any *mercurial* (see *art.* Poisons, § 568, *et seq.*). This unpleasant result is sometimes induced by exposure to cold, or to currents of cold air about the head and neck, during or soon after the use of mercurials, or from the suppression of the salivary discharge by these causes. When the tongue is affected from excessive mercurial action, or suppression of the salivary flux, there is generally much more tumefaction than actual inflammation of the organ; the inflammatory action even, when present, possessing much less of the true sthenic or phlogistic character than when the disease appears in an idiopathic form.

20. Glossitis also occurs symptomatically, and forms an important complication, in *scarlet fever* and in *small-pox*. Reil observed it in several cases of an epidemic fever which occurred in the north of Germany near the termination of the last century (*Fieberlehre*, ii., p. 370); and Van Swieten, Delamalle, Louis, Marjolin, and myself, have seen it supervene in the progress of malignant fevers. When thus complicated, glossitis is generally asthenic, diffusive, or spreading, the parts adjoining being more or less implicated, and the danger of the disease thereby greatly increased. I have seen this complication also in Erysipelas, and have adverted to it when treating of that disease.

21. v. Superficial and Partial Glossitis.—This is generally a more chronic form of the disease than any of the foregoing. It consists chiefly of an inflammatory state of the villous surface of the tongue, and is much more common than inflammation of the substance of the organ. This is very frequent in young children, consisting generally in an extension of inflammation either to or from the adjoining parts. It is thus very often met with in aphthous affections (*see* Thrush), in inflammation of the mouth and gums (*see* Stomatitis), and Cynanche maligna (*see* Scarlet Fever and Throat, &c.). In this partial and associated form of glossitis the edges of the tongue are chiefly affected, but the whole of its surface may also partake more or less of disease, and the organ may also be swollen. The inflammation may be, moreover, of a specific kind—not only of the kinds just mentioned, but *syphilitic*, with or without ulceration. This state of the disease is even occasionally met with in infants, and has been caused by the affected nipples of nurses. This partial form of glossitis may also proceed from mercurial action. It is attended in this case with more than ordinary loss of the vital cohesion of structure; the edges and sides of the tongue have an inflamed, swollen,

flabby, and unhealthy appearance, and retain the impressions of the teeth, against which they are forcibly pressed by the tumefaction of the organ. This state of partial glossitis sometimes gives rise to fungous excrescences of a soft, flabby, and vascular character, shooting between the teeth, and bleeding on the slightest irritation.

22. Partial or superficial glossitis is much more frequently seen in the course of scarlet fever, small-pox, continued fevers, &c., than the form of the disease noticed above (§ 20) as complicating these maladies in rare instances. It often occurs, also, in the inflammatory affections of the throat, as an extension of these affections (see *arts.* Stomatitis and Throat); and not unfrequently it is symptomatic of disorder of the prima via, particularly of the stomach and liver, arising from the accumulation of morbid secretions. Owing chiefly to this cause, it is sometimes also observed accompanying several acute cutaneous eruptions, as urticaria, &c.

23. vi. Chronic Superficial Glossitis.—This form may be confined chiefly to the sides or edges of the tongue, or may extend over the whole surface. In either case I have seen it as the chief lesion or affection, while it has been more frequently associated with a similar affection of the gums, fauces, and pharynx. It is a common complication in *scurvy*, and then it is generally removed in due time by the means recommended for that disease; but in other circumstances it is a most obstinate, and often serious, but a rare malady. In some cases, the redness and peculiar raw appearance of the tongue have apparently extended not only to the fauces and pharynx, but also to the œsophagus, and, in some degree, to the villous surface of the stomach. When the disease is confined chiefly to the sides or edges of the tongue, the irritation caused by carious or irregular teeth may have occasioned or prolonged it; but, when it is more general, the digestive viscera are in fault, and, owing to the nature of their disorder, the affection of the tongue varies in severity and duration. In a few cases of this disease which I have seen, the redness, pain, heat, and soreness of the tongue were very much complained of; and they had been of considerable or long duration before I saw them. The gums were also red, retracted from the teeth, and the fauces and pharynx were more or less affected. The surface of the tongue was deprived of its papillæ, was raw and inflamed throughout, acutely sensitive, but the organ was not much swollen, although it was the part more especially affected. Of five or six cases of this disease that I have treated, two went from under my observation after having been some time under treatment without much apparent benefit. The others were also obstinate, but recovery or relief followed the means about to be noticed (§ 36, *et seq.*). One of the cases was imputed to the use of iodide of potassium in large doses. In all, the extreme tenderness of the tongue and mouth, the difficulty of taking solid food, or of masticating any food, the pain on deglutition, the disorder of all the digestive functions, and the occasional irritability of the stomach and bowels, the torpor of the liver, the state of the urinary discharges, &c., had occasioned more or less emaciation, with other indications of cachexia, and shown the relations of the disease. This form of glossitis appeared to have been, in all the cases, symptomatic of prolonged or neglected disease of the digestive organs, more especially of the villous surface of the digestive canal.

24. vii. The Prognosis of glossitis may be inferred from what has been stated respecting its forms and terminations.—*a.* When the disease has been produced by an animal poison; when the attack is sudden and violent, and the swelling is great; when the constitutional disturbance is very considerable, and the pulse is quick and weak, the disease is then attended by great, or even extreme danger. The risk is generally greater in the *asthenic* than in *sthenic* cases; but, even in the latter, when the tongue is greatly swollen, or much discoloured, and the suffocative symptoms urgent, the danger is then very considerable. In the milder idiopathic forms, especially when the treatment is judicious and prompt, the prognosis is favourable. When the disease is *complicated* with any of the forms of cynanche, or is attended by much swelling, pain, and tenderness about the throat and angles of the maxilla, the danger is considerable, as the extension of inflammation either from or to the tongue indicates both a severe form of disease, and a faulty state of the vital power and habit of body of the patient.

25. *b.* The termination in *abscess*, although an unpleasant occurrence, is not generally attended by danger; indeed, in persons not otherwise diseased, the constitutional symptoms not being very urgent, no risk may be apprehended, particularly if the abscess be limited in extent, or confined chiefly to one side of the tongue. If suppuration, however, take place in an unhealthy subject, and be attended by a very quick, irritable pulse, by depression of the vital energies, by delirium towards night, coma, followed by a fatal issue, should be expected. Sphacelus and gangrene rarely occur, but recovery never takes place when they appear in this organ as a termination of either primary or complicated glossitis.

26. *c. Partial* glossitis and *chronic* glossitis, especially when affecting aged persons, are often very obstinate diseases; the latter especially. When the partial glossitis is caused by carious or irregular teeth, or has often occurred, or has gone on to ulceration, it is very difficult of cure. The ulcerations may become indolent, or be followed by hardening, enlargement, or even by scirrhus and carcinoma. The tongue may thus present a very dangerous state, which, although at first local, may, in its advanced stages and malignant form, assume a constitutional and fatal character. *Chronic* glossitis is always a protracted and unfavourable form of disease. In all the cases I have seen, it formed only a part of very complicated states of disease, but a very distressing part, requiring both discrimination and perseverance in both the local and constitutional treatment.

27. viii. Treatment.—*A.* Of Acute Glossitis.—The treatment of this disease should be modified according to the causes producing it. When it has arisen from causes the operation of which still continue, as the irritation occasioned by irregular or carious teeth, foreign bodies, &c., these should be removed as soon as possible. When it has originated in causes which are not depressing to the vital energies, the means of cure should be very different, or even opposite to those which are required when it is caused by poisonous agents. In the former circumstances the disease presents a *sthenic* character, in the latter an *asthenic* form, both locally and constitutionally.

28. (*a*) *Sthenic Glossitis.* — In this form the vital energies are not impaired, although vascular action be locally and generally excited. Hence vascular depletions are promptly required, with an activity proportionate to the severity of the disease. Authors, however, differ as to the situation from which the blood should be abstracted. Many recommend the application of a number of leeches,* or scarifications and cupping, about the throat, angles of the jaws, and neck, after venesection in the arm; others advise blood-letting from the raninal veins, or from the feet; while some prefer the application of leeches to the inflamed tongue.† The determination of this matter may be of some consequence, and it may be even next in importance to the amount of blood which should be taken away. In these matters the physician should be guided by the causes and the severity of the disease. But in acute sthenic glossitis, blood-letting, whether general or local, or both, will not of itself cure the disease, unless in its less severe forms; and in those which are severe, the raninal vessels cannot generally be reached.

29. The very slight advantage derived from vascular depletion in this disease, as usually performed, has been long known to physicians, and has led them to the adoption of other measures of a decisive character, and productive of a locally depleting effect, namely, of *incisions* made into the substance of the inflamed organ. This practice seems to have been first resorted to by Job Meckren in 1656, and it has been generally followed ever since. Delamalle, Naumberg, Stoeller, J. P. Frank, Arnemann, Hildenbrand, Schneider, Delatour, Van Dekeere, Marjolin, and others, have prescribed it in many cases. Louis states that *incisions* have failed only in those cases where they have been too superficial, and he therefore advises that they should be deep, and consist of from two to four, made longitudinally near the edges of the organ—one or two on each side of the median line, from the base to near the point. A copious discharge of blood should be promoted from the incisions by emollient applications, by the steam of warm water or medicated vapours, by suitable gargles and washes, &c., which will, at the same time, favour the termination in resolution. In the cases which I have seen, incisions were successfully employed. In two cases, suppuration had advanced before I was consulted, but incisions were directed and were equally beneficial.‡

30. Other antiphlogistic means are also required in this form of the disease, especially cooling purgatives and diaphoretics. Drastic purgatives are often necessary at the commencement of the treatment, and although Broussais and his followers—the master and disciples of a now obsolete school—have inveighed against them, experience has demonstrated their utility. Galen, Van Swieten, and many others, have recommended them. Their operation should be assisted by active purgative injections. The excessive thirst accompanying the disease may be calmed by a solution of cream of tartar, with a little nitre in tamarind water. If deglutition be prevented by the swollen state of the tongue, the urgency of this symptom may be moderated by tepid or warm bathing, by emollient lavements, and by cooling and emollient fomentations to the throat, and by applications to the tongue itself. Injections of a similar nature should be thrown into the mouth, which the patient ought to be directed to gargle or wash frequently with emollient infusions and decoctions. Speranza advises an infusion of digitalis for this purpose.—(*Annali Univ. de Med.*, Jan. 1829.) Marjolin recommends gargles and lotions with diluted vegetable acids. A solution of the biborate of soda and bitartrate of potash, or of the former alone, in the decoction of marsh-mallows, or in linseed tea, is one of the best gargles or washes in this disease. I have employed it with benefit in this form of glossitis, as well as in the other forms which I have designated partial and superficial. Linctuses, consisting of mucilages or honey, or sirup of roses, and containing either the muriate of ammonia or the nitrate of potash, are also of considerable benefit, both in these states of the disease and in the partial and superficial forms.

31. In addition to the above means, external and internal *derivatives* or *revulsants* have been resorted to, as *blisters* or terebintinate *embrocations* applied beneath the lower jaw, or to the nape of the neck, and repeated; *sinapisms* to the lower extremities, stimulating pediluvia and manuluvia, drastic *purgatives*, and irritating *enemata*, &c. M. Dupont advised, after incisions or scarifications of the tongue, an active *emetic*; and I believe the practice to be judicious. Among other means, substances calculated to excite the action of the salivary glands have been recommended by Blancard and Marcus. Mercurial preparations may be prescribed for this purpose when the disease is not of mercurial origin, but their action is not sufficiently rapid nor certain. Speranza advised lotions of infusion of digitalis.

32. (*b*) Asthenic Glossitis, especially when it becomes diffusive, or has been induced by the contact or inoculation of an animal or any other poison, often assumes a very violent and dangerous form, the lividity and swelling of the organ being great, the local and constitutional symptoms indicating a powerful sedative influence on the system. Consequently, a different treatment from that advised above is required, and that treatment should be promptly decided on and energetically carried out. Still the severity and the cause of the disease should decide the adoption and the selection of the means. Vascular depletions, as usually practised, are not required in this form of the disease, and are rarely productive of any benefit. Yet *incisions* into the tongue (§ 29) may even here be practised with advantage. The cases of Stoeller prove their advantage in this state of the disease. Indeed, incisions may be more advantageous in this than in any other form of the disease, by allowing the discharge of the poisoned exuded fluids, causing the swelling and contamination of the organ. After they have been made, the tongue and mouth should be afterward often washed with a decoction of cinchona, with either of the mineral acids and camphor, or with a strong infusion of green tea, or of arnica, or with strong tar-water; or these ought to be injected into the mouth, when they cannot be otherwise taken into it; and full

* [Professor Wood says, "As many as one hundred American leeches may be applied at once, if the strength of the patient permit. They should be preceded by venesection."]

† [Leeches are better when applied in the vicinity of an inflamed organ than immediately to it.]

‡ [If incisions and the other measures prove unsuccessful, and suffocation is threatened, laryngotomy or tracheotomy should be at once resorted to.—*Ed.*]

doses of the preparations of cinchona, of serpentaria, or of arnica with camphor, or with hydrochloric acid and hydrochloric ether, or with ammonia and its preparations, should be often administered, in such forms and vehicles and in such a manner as circumstances will suggest or require. If an animal poison has occasioned the disease, fluids containing the turpentines, or creasote, or the chlorides, &c., ought to be introduced into the mouth, and the tonics and stimulants assidulously administered, conjoined with alkalies, or with chlorides, or with other medicines already mentioned, both by the mouth and in enemata.

33. (*c*) *Glossitis, symptomatic* of, or *complicated* with, eruptive or malignant fevers, is generally of an asthenic character. Blood-letting is injurious in these cases, beyond the local discharges proceeding from the incisions, which also may be necessary, and which should then be made, when the tumefaction and pain, or sensation of suffocation, are urgent. While the primary or the special disease ought to receive due attention, and be treated appropriately to its form and stage, the local complication, according as it may present more or less of the characters appertaining to either of the cases above described, should be treated conformably with the recommendations already offered.

34. When the disease has gone on to *suppuration*, then incisions into the adjoining parts, and a free opening into the part in which the matter is either forming or is collected, should not be neglected. If there be little or no swelling unless that produced by the collected matter, a free opening into it will generally suffice. But when the matter is formed in the asthenic form of the malady, or after inoculation or contact of a poison, incision or scarifications of parts adjoining may be required.

35. The severe states of glossitis caused by mercury have been likewise treated by incisions by Plenk, Delamalle, Friese, Schneider, and others. Louis advises blood-letting, and agrees with Plenk and others in the active administration of purgatives, drastic enemata, sudorifics, diuretics, astringent and cooling washes, and change to a dry and healthy atmosphere. Emetics have also been recommended, and I have prescribed washes with tar-water, with creasote, with the chlorides, and with several other substances, the affection continuing notwithstanding for a considerable time in some cases. (See *art.* Poisons, § 590, *et seq.*, and Stomatitis, § 20, *et seq.*)

36. *B. Partial and Superficial Glossitis.*—Most of the local means already advised may be prescribed in this state of the disease; but in all cases due reference should be had to the predisposing and exciting causes, and to the states of the digestive, the assimilating, and of the depurating functions, and of the constitutional powers. The lotions, linctuses, &c., washes or gargles, mentioned above (§ 32), or those prescribed in the *art.* Stomatitis (§ 14, *et seq.*), or solutions of either of the mineral salts, as the sulphate of zinc, the nitrate of silver, &c., may be severally employed as circumstances will suggest. These last, or the dilute mineral acids in tonic or astringent decoctions, and used as washes or gargles, are most appropriate when ulceration is present. In most of the cases which come under the present category, the treatment and means advised under the heads Stomatitis and Thrush are quite appropriate.

37. *C. Chronic Glossitis*, whether it be limited to the sides or edges of the tongue, or whether it be more general and superficial, is always a most obstinate disease, and is often merely a severe local manifestation of a very general and serious malady, or at least of a protracted disease of the digestive organs. Hence, in addition to the local means already recommended—to the use of vegetable, of saline, and mineral astringents and refrigerants, of emollients and demulcents, &c.—general and constitutional remedies, directed especially to the restoration of the digestive, assimilative, and depurative functions, or to the removal of whatever lesion or disease which may be inferred to exist in any of the organs devoted to the discharge of these functions, should be prescribed, and their effects closely watched and aided by a suitable diet, regimen, and change of air. Cachectic symptoms should be combated; and when the diet, mode of living, air, water, or residence of the patient appear to have originated or concurred in producing the malady, these especially should all or severally be ameliorated, or altogether changed.

38. The principles now stated and developed above, as well as in other places in this work, must be guides to the inexperienced in the treatment of the diverse forms and complications of glossitis; for it is impossible to lay down rules, or to furnish illustrations or explanations of such rules, as will be altogether appropriate to the diverse cases which may occur in practice. In such cases, as in those of other diseases, the physician must think and decide for himself, and, by thus habituating himself, he will ultimately more certainly arrive at correct practical conclusions.

IV. Organic Lesions of the Tongue.

Classif.—IV. Class, I. Order (*Author in Preface*).

39. The structural alterations of the tongue are consequences either of inflammation, or of unhealthy or cachectic states of the constitution, or of chronic disorders of the digestive organs. Inflammations, either primarily or consecutively affecting the tongue, are rarely of any considerable duration, without changing more or less the structure of the organ; still they cannot be viewed in their earlier stages especially as falling within the category of structural lesions. Cachectic states of the constitution may variously alter the organization of a part or organ, independently of inflammatory action, by either impairing, increasing, or otherwise altering the nutrition of that part, or by changing its cohesion, consistence, bulk, &c.; and prolonged disorder of the digestive organs may sympathetically occasion similar effects on this part. Organic lesions of this organ may, moreover, be produced by specific poisons or infectants.

40. i. Ulceration of the Tongue.—This lesion is frequently a consequence of partial or chronic glossitis, especially when limited to the sides, edges, or point of the tongue. It is often also a result of Stomatitis and Thrush, and of exanthematous and continued Fevers, more especially of Scarlet Fever and Small-pox. It frequently complicates Scurvy, and is often caused by the prolonged irritation of irregular or carious teeth. These antecedents are sufficiently indicative of the nature and treatment of the lesion. But the ulceration may be of a *specific nature*, and, it may be, *primarily*, or *consecutively*, or *secondarily specific*: as such it falls within

the category of Venereal Affections. Irrespective of these states of ulceration, there are others which not unfrequently are subjects of interest and concern to the physician—which cannot be imputed to these affections, and which require both a local and constitutional treatment.

When ulceration of the sides of the tongue is the result of prolonged irritation of irregular or carious teeth, both the nature and the treatment of it is obvious. As a consequence of scarlet fever, small-pox, and fever, the ulceration generally heals with the progress of convalescence. In rare instances, however, it becomes obstinate and chronic, requiring the application of strong solutions of the nitrate of silver, or the bichloride of mercury, of the tincture of iodine, &c. These ulcerations are seldom on the dorsum or middle superior surface of the organ; but, when they are thus situated, the constitutional disorder is then chiefly the cause, unless some local disorder of the surrounding parts have complicated and increased the affection. One of the most difficult cases of ulceration in this situation occurred in a case of typhoid fever, and was manifestly caused by the patient having, in the course of his delirium, taken a tongue-scraper, and forcibly removed the long dark fur covering the tongue; this fur evidently tending to protect the surface of the organ during the advanced stages of the fever.

41. Ulceration of the tongue may, however, take place without very manifest antecedent inflammatory action—at least without any severe or prolonged state of this action, and without any evidence of the state of the opposite teeth being its cause. The conditions of the digestive organs, especially of the stomach and collatitious viscera, or of the system generally, are, in most of these cases, the chief assignable causes; especially when the ulceration does not present either specific or malignant features. In some instances, even when these features may be expected, or are about to be developed, they may not be clearly manifested; for the ulceration may be either indolent, chronic, and variously characterized; and yet it may be difficult to state with certainty its cause, nature, or probable issue—the antecedents, concomitants, or history of the case being the chief guides. An ulcer in the side of the tongue, when caused by the teeth, may be cured with difficulty, even after the cause is removed; and when it has followed protracted disorder of the digestive organs, or a scorbutic attack, it is not readily healed in many cases, after the disorder of these organs, or after a general cachexia, is either removed or greatly ameliorated, especially in aged persons. The dread of consecutive malignancy, or cancerous degeneration, always suggests itself; and, although such a result may not take place, we know that it often has occurred in such cases, or that the cancerous nature of the ulceration does not always distinctly declare itself at first.

42. ii. Cancer of the tongue is not infrequent.—*A.* Dr. Walshe states that out of 8289 fatal cases of cancer reported in the Paris registers in 1836, it was primarily or mainly seated in this organ. Scirrhus is its usual form, passing into ulcerations; but fungous excrescences sometimes appear, or exhibit the encephaloid character. It may attack any part of the tongue, especially the sides. I have seen three cases where it affected one side chiefly of the thick part or base of the tongue, extending to the isthmus of the fauces and even to the pharynx, occasioning remarkable dysphagia and its usual symptoms. It may commence as a small, somewhat knotty, and irregular tumour, generally seated in the anterior part of the organ, midway between the raphæ and the edge, or rarely extending beyond the middle line. It sometimes appears as a small excrescence. In very rare cases the cancerous matter is deposited in erectile tumours. Simple ulcers of a chronic or indolent nature may become cancerous; but instances of this occurrence are comparatively rare. In all cases, when the surface ulcerates, the glands become affected in the usual way. Distant organs are not frequently implicated. There is generally an aching sensation in the affected part and vicinity, with occasional sharp or darting pains towards the ear or throat. Pain and difficulty in speaking, masticating, and swallowing are always present, and increase with the progress of the disease, until these functions can no longer be performed. Incessant sputation is always present, and is most distressing. The cancerous cachexia and emaciation are always very remarkable. According to Mr. Travers, strong males, upward of forty years of age, are the most frequent subjects; but the disease is not rarely observed in much younger persons and in females.

43. *B. The Diagnosis* of cancer linguæ is sometimes difficult. The history and antecedents of the case should be duly considered. Cancer may be mistaken for *simple induration* of a part or side of the tongue—an affection noticed by Ruysch and Percival, and most frequently seated in the base of the organ. This induration may depend upon tubercular deposits, and be attended by ulceration; but it is not apparently malignant, although it may possibly become so. Mr. Travers has described a *globular tumour* seated deeply in the tongue, which is characterized by an unyielding and uniform surface. Both these forms of lesion are best *treated* with tonics and alkalies conjoined with the iodide of potassium. The *fissured and dyspeptic ulcer* may bear a near resemblance to cancer, but it has not the hard basis of the latter, is often in the middle line, the rest of the tongue being often chapped or fissured. It is frequently complicated with psoriasis. *Syphilitic ulcers* are not easily distinguished from cancer linguæ. They are generally larger, have less marked and less circumscribed hardness of their margins: their discharge is less abundant, and they want the firm everted edge and sprouting edge of the latter. The history of the case should be strictly ascertained. "Dr. Warren describes an *enlargement of mucous glands* occurring on the side of the tongue, with a red fungous appearance, but differing from cancer in being sensitive, not painful, and unattended by real ulceration or thickening of the organ. *Hypertrophy of the mucous membrane* sometimes gives rise to irregular fissured elevations on the surface." *Erectile tumours* are known by their pulsation; but they become seats of cancerous deposits.

44. *C. The Treatment* of cancer of the tongue is palliative only in most cases. As the disease often primarily attacks this organ, the removal of it by surgical operations may be attempted before the glands in the vicinity become affected. Successful cases of this kind have been published by Mr. J. M. Arnot and others (*see the modern Works on Surgery*)

[The *diagnosis* of cancer of the tongue is, like that of other cancers, in many cases, difficult, if not impossible. Even after its extirpation, when we can examine it at our leisure, and with all the microscopic and other aids in our power, we cannot always decide with certainty as to its nature. Our diagnosis is to be based, 1st, on the peculiarity of the development of the tumour and the changes which take place in it; and, 2d, on the presence of true cancer-cells, *viz.*, the *irregular caudate*; the *large cells with many cytoblasts and young cells*; *cells with a thick wall*; and the *accumulations of cells in fibrous capsules*; all of which are readily distinguishable from pus-corpuscles, or the indefinite cellular structure of tubercle; and in proportion to their abundance, preponderance, and perfect condition, will be the certainty of our diagnosis. It is certain that, before the stage of softening, a correct diagnosis must be founded exclusively on the presence of cancer-cells; and the only successful treatment is the entire removal of the diseased mass by the knife or caustics. It is the nature of every true cancerous tumour to increase continuously; as nature has adopted no means, as in the case of tubercular and other tumours, of limiting its growth. Hence, as we know as yet of no *specifics* for the cure of cancer, the only proper mode of treatment is *the early use of the scalpel*. We need not dwell on the necessity of the entire radical extirpation of the diseased part, whether the knife or caustic be employed, as every one knows that, if any cancerous matter remains behind, it will grow much more rapidly than before, in consequence of the more abundant secretion of cytoblastema. But a radical cure is not to be expected if the surrounding parts are not in a healthy condition, or the original cancerous diathesis is not eradicated. As the diagnosis, then, of a cancerous tumour in the living body is uncertain, it is expedient, in all cases of chronic tumours of the tongue, to extirpate them immediately, and before ulceration takes place; as no harm will occur from the removal of an innocent tumour, while, should it prove cancerous, the worst consequences may result from leaving it till ulceration takes place.]

45. iii. Hæmorrhage from the tongue rarely occurs unless from accidents or operations, or in the far-advanced stages of diseases especially affecting the crasis of the blood and the vital cohesion of the tissues. In these latter circumstances it is chiefly met with in some extreme cases of mercurial affection of the tongue, and not infrequently in yellow or hæmagastric pestilence, and in scurvy. In these maladies the blood often exudes from the surfaces of the tongue and gums more or less copiously. J. P. Frank notices a case of the latter disease in which the hæmorrhage was so abundant from the tongue as to prove fatal. For these occurrences, as well as for others of a similar nature, the most appropriate *treatment* is the local application of spirits of turpentine, by means of lint or sponges, while the same medicine is taken by the mouth, in doses suited to the peculiarities and urgency of the case. The other means advised, when treating of *Passive* and other forms of Hæmorrhage (see § 40, *et seq.*), may be employed if this fail.

46. iv. Induration of the tongue is rarely met with unless in connexion with tumour (§ 43), or some degree of enlargement. It has, however, been noticed by Ruysch and Percival. It is occasionally seen in some degree in cases of syphilitic contamination. For such, the *treatment* should consist of the means advised for Venereal Cachexia. In other circumstances the alkalies with iodide of potassium, or the iodide of mercury, or the bichloride of mercury, with conium, may be prescribed.

47. v. Enlargement of the tongue, often to a very remarkable degree.—*Hypertrophy and Elongation* have been described by several writers.—*A.* The enlargement has been generally so great as to cause the protrusion of the organ two or three, or even four, inches beyond the lips, the thickness and the breadth of the tongue being also greatly increased. I had frequent occasion to see a very remarkable case of this kind, many years ago, in a female. The instances of it adduced by Zacchias, Bartholinus, Camper, Trioen, Poilreux, Arnemann, Scaliger, Sandifort, Portal, and others, and very recently by Messrs. Humphry, Hodgson, and Teale, as well as those described by the writers about to be noticed, present a remarkable similarity as to the appearance and nature of the enlarged organ. This lesion is well illustrated (by plates) and described by Mr. Humphry in the work referred to. The structure of the organ was not altered otherwise than hypertrophied. This disease is quite different from the tumefaction of the organ produced by inflammation or by excessive mercurial action; as it is permanent when not restrained by surgical treatment, and is not occasioned by the causes just mentioned. In the case which I saw the disease commenced in childhood, and had continued without change up to the period when I examined it, when the subject of it was upward of 40 years of age.*

[*Hypertrophy* of the tongue may be limited to its muscular substance, its mucous covering, or its papillæ. The former variety may be congenital, and we know a family of several children, all of whom labour under it to a greater or less extent. In adults it may occur as the consequence of glossitis, or without any assignable cause. Of the former, Dr. Harris, of Philadelphia, has published a case, in a girl, twenty-four years of age, which progressed until the organ protruded four inches beyond the incisor teeth, measuring one inch and three fourths in thickness by six inches and three fourths in circumference; the projecting portion being dense, of a dark chocolate colour, and constantly covered with a thick, tenacious mucus. The part within the mouth was entirely free from disease, excepting the lenticular papillæ, which were about five times the natural size. In another case, reported by the same surgeon, the hypertrophy was congenital, and was attended with unusual shortness of the rami of the lower jaw, with great separation of the incisor teeth (*Am. Jour. Med. Sci.*, vol. vii., p. 17; *Ibid.*, vol. xx., p. 15).

Dr. Wells, also, has described a case (*West Jour. Med. and Phys. Sci.*, July, 1832) in a girl six years of age, where the tongue, preternaturally dense and rigid, hung down two and a half inches beyond the teeth of the upper jaw, and was more than two inches in breadth. The patient had suffered much from inflammation and

* [Dr. Paget mentions two cases of *fatty tumour* of the tongue, one of them 1¼ inch long, and another, which he removed, of a *fibro-cellular* nature, firm yet succulent, and forming an obscurely filamentous tissue, abundantly nucleated.—*Lect. on Surg. Path.* Phil., 1854.]

ulceration of the mucous membrane of the tongue. This lesion would seem to be more common in the female than the male, and is most frequently the result of inflammatory irritation. "Enlargements of this kind," says Dr. Gross, "are sometimes remarkably vascular, being pervaded by plexuses of dilated vessels, and subject to temporary erections from the preternatural influx of blood. Dissection shows that the fleshy fibres of the tongue have lost their normal colour, and that they are converted into a dense, semi-cartilaginous substance, with scarcely a trace of the primitive structure. In some cases the enlargement of the organ would seem to be occasioned by the development of nævous-like structure." —*Path. Anat.*

Hypertrophy of the *mucous membrane* of the tongue is usually limited to one or more points, or extends to the whole surface, varying in thickness from the twelfth to the third of an inch, and exhibiting a rough, grayish appearance, the prominence being sometimes divided by deep fissures. There is usually no pain attending it, but the sense of taste is much blunted or entirely destroyed. The *papillæ* may also become hypertrophied from gastric derangement or local injury, and thus form tumours of the size of a pea or larger, of a deep florid colour, resembling cancerous excrescences, but distinguishable from them by the absence of pain and ulceration. In these cases it is the circumvallate papillæ that are enlarged. The epithelial caps of the conical or filiform papillæ may become extraordinarily elongated, so as to be half an inch long (*Salter.*) They are of a dark colour, and look like little brown hairs. Minor degrees of this condition are not uncommon. In some cases the papillæ become atrophied.

Atrophy of the tongue is a rare lesion, but is occasionally met with. It is sometimes associated with inflammatory irritation or paralysis, and may proceed to such an extent as to leave only a dense, whitish mass, with scarcely a vestige of muscular tissue.

The tongue is also liable to *congenital malformations*, as bifurcation, extreme smallness, nipple-shaped, double, or even it may be wanting. The frenum may be too long, too short, preternaturally thick, and of a dense, fibro-cartilaginous consistence.

Mr. Earle, of London, has described a peculiar disease of the tongue, consisting in very minute, semi-transparent *vesicles*, occupying the muscular substance of the organ, elevating sometimes the mucous membrane in the form of little tumours. In one case they grew in clusters, and were so sensitive as to bleed profusely on the slightest injury. The clusters, in some places, were separated by deep clefts, which discharged a fetid, irritating sanies. *Polypoid growths*, which seem to be of the nature of fibrous tumours, or, in some cases, of enchondroma, are sometimes met with in the tongue; also *fatty tumours* and *simple cysts*. The *cancroid* tumours of the tongue, described by Dr. H. Bennett, would seem to be true cancer.]

48. *B. The Treatment* of this lesion is entirely surgical, and has been successfully conducted by, 1st. Pressure; 2d. Ligature; 3d. Incisions; and, 4th. Amputation. The treatment by *pressure* has been employed successfully by Lassus (in two cases), Louis, Ruhbaum, Clanny, Freteau, Crosse, and Teale. *Ligatures* were employed by Inglis, Bierkin, Van der Haar, Mirault, Siebold, Edhold, Cooper, Wells, Liston, and Hodgson. *Incisions* were practised by Zacutus Lusitanus and Schneider. *Amputation* was resorted to by Pamard, Ficker, Klein, Percy, Harris (in two cases), Nevermann, Leber, Newman, Mussey, Pimpernell, Syme, and Humphey. The result was fatal in Siebold's, Liston's, and Syme's cases. *Pressure* would therefore appear to be the least dangerous mode of treatment.

Biblioc. and Refer.—*Dioscorides*, l. i., c. 234.—*Pliny*, Hist. Natur., l. vi., c. 30.—*Celsus*, l. vii., c. 12.—*Galen*, De Locis Affect., l. iv., c. 2.—*Aëtius*, Tetrat. ii., serm. i., c. 118; serm. iv., c. 38.—*Avicenna*, Canon., l. iii., Fen. 6, Tract. 2, c. 2.—*Riverius*, Observ., Cent. iv., n. 24.—*Zacchias*, Quæst. Med. Leg., l. ii., 8, l. iii., l. v., 5.—*Diemerbroeck*, De Peste Hist., 36. (*Carbuncle of.*)—*Forestus*, l. xiv., obs. 24 (*Carcinoma*), observ. 28 (*Hypertrophy*).—*Zacutus Lusitanus*, Med. Pract. Hist., l. i., n. 71, et p. 478.—*F. Hildanus*, Cent. iii., obs. 84; Cent. iv., obs. 20.—*Plater*, Observat., l. i., p. 98.—*Borellus*, Observ., cent. ii., n. 63.—*Schenck*, Observ., l. i., No. 382.—*Mortimer*, in Philosoph. Transac., No. 486.—*D. C. Valther*, De Rariasima Affectu Glossagra, 4to. Erf., 1701.—*Bonet*, Sepulchret., l. i., sect. xxi., obs. 19, 20, 21.—*Tyroen*, Observat. Med. Chirurg., p. 142. (*Ling. Hypertroph. ex Febre.*)—*Penada*, in Mem. di Matem. e Fisica della Societa Italiana, t. viii., No. 2. (*Duplex.*)—*Eschenbach*, Observata, p. 8.—*T. Bartholinus*, Hist. Anat., Cent. ii., No. 22; Cent. iii., 43.—*Hoffman*, Consult, Cent. i., n. 58. —*Trincavelli*, Consil., l. iii.—*Ficker*, Beytrage, n. 8. (*Ling. Enormis amputata.*)—*Ruysch*, Observat. Anat. Chirurg., No. 76.—*Cyrilli*, in Haller's Biblioth. Chirurg., ii., p. 211.—*Morgagni*, De Sed. et Caus. Morb., Ep. lxviii., 10.—*Thilenius*, Med. a. Chirurg. Bemerkungen, i., p. 107. —*Sandifort*, Observ. Anat. Pathol., l. iv., c. 9.—*Scaliger*, Exercit., 199.—*Meckren*, Observat. Med. Chirurg., cap. 23.—*De la Motte*, in Mem. de l'Acad. de Chirurgie, t. v., n. 16.—*Hayes*, in Mem. of Med. Society of Lond., vol. ii., p. 189.—*Sherwen*, in Ibid., vol. ii., No. 18.—*Vallisneri*, Opera, iii., p. 167, 552.—*Gilibert*, Adversar. Pract., p. 21. (*Conium in Carcinoma Linguæ.*)—*Lassus*, in Mem. de l'Institut National pour l'An. iv., t. i.—*Louis*, in Mem. de l'Acad. de Chirurg., t. v., No. 15. (*Enlarged.*)—*I. P. Frank*, Acta Instit. Clinica Vilnensis, t. iii., p. 120. (*Enlargement after a Bite*); et Interpret. Clin., t. i., p. 160. (*Inflammation, Suppuration*); et Ibid., t. i., p. 178. (*Scorbutic Hæmorrhage, Fatal*); et de Curand. Hom. Morb., l. ii., p. 94.—*Bierken*, in Hufeland u. Himley, Jour. der Pract. Heilk. Inl., 1811, p. 118. (*Elongated and Hypertrophied removed by ligatures.*)—*Sauvé*, Essai sur l'Affect. de la Langue Prolapsus, &c. Paris, 1812.—*Poilroux*, in Journ. Génér. de Méd., t. xxix., p. 388. (*Tumour, Fatal.*)—*Schæffer*, in Hufeland, Jour. der Pract. Heilk. Dior., 1810, p. 20. (*Hypertrophy of.*)—*Inglis*, in Edinb. Med. and Chirurg. Journ., 1805.—*Oberteuffer*, in Loder Journ. für Chirurg., b. iii., p. 398. (*Corrosive Sublim. for Carcin. Ling.*)—*Percival*, Pract. Essays, i., p. 37. (*Induratio Foliis Belladonnæ sanata.*)—*Conrade*, in Arnemann Magazin., &c., b. i., p. 151. (*A Blister to the Throat for Glossitis.*)—*Delatour*, in Revue Méd., t. i., 1825, p. 452.—*Gottel*, in Ibid., t. i., 1826, p. 128.—*Van Dekeere*, in Archives Génér. de Méd., t. xviii., p. 94.—*Speranza*, in Ibid., t. xix., p. 407.—*Piorry*, in Ibid., t. xxi., p. 568.—*Portal*, Cours de l'Anat. Méd., t. iv., p. 507. (*Ling. Magna intus steatomatosa.*)—*Ebermajer*, in Hufeland Journ. für Pract. Arzneyk., b. v., p. 278.—*Loeffler*, in Ibid., b. iii., p. 695; et in Loder's Journ., &c., b. i., p. 599. (*Incisions for Glossitis.*)—*Reil*, Fieberlehre, ii., p. 370.—*Frétçau*, in Journ. Gén. de Méd., t. lvii., p. 286. (*Intumescence and Elongation of the Tongue.*)—British and Foreign Medico-chirurg. Review, July, 1850, p. 54.—*C. T. Quintard*, in Lond. Journ. of Medicine, No. xxxiii., p. 845.—Hufeland, Journ. der Pract. Heilk., b. xiv., p. 201. (*Paralysis Linguæ Chenopodio Ambrosioide Sanata.*)—*Richter*, Med. u. Chirurg. Bemerkungen, p. 166.—*J. Mitchell*, Case of Spasmodic Affection of the Tongue successfully treated, in Trans. of Roy. Med. and Chirurg. Society, vol. iv., p. 25.—*C. Lane*, in Ibid., vol. viii., p. 201. (*Ulcer of Tongue treated with Arsenic.*)—*H. Earle*, in Ibid., vol. xii., p. 283. (*Disease of Tongue caused by irritation, and resembling Cancer, treated by Henbane.*)—*B. Travers*, On Cancer of T., in Ibid., vol. xv., p. 245; et Ibid., vol. xv., p. 257. (*On Ulcers of the T.*)—*T. M. Arnott*, in Ibid., vol. xxii., p. 20. (*Case of Malignant Disease of T.*)—*E Williams*, An Essay on the Tongue in Functional Derangements of the Stomach and Bowels, 8vo. London, 1843.—*Percy et Laurent*, in Dict. des Sciences Médicales, t. xxvii., p. 244. (*Cases of Hypertrophy and Elongation of the Tongue.*)—*Breschet et Finot*, in Ibid., t. xviii., art. *Glossite.*—*Begin*, Dict. de Méd. et de Chirurg. Pract., art *Glossite*, t. ix.—*Desormeaux*, in Dict. de Méd., 2d

ed., art. *Langue*, Maladies de la.—*Ker*, in Cyclopedia of Pract. Medicine, vol. ii., art. *Glossitis*.—*G. M. Humphry*, Hypertrophy and Prolapse of the Tongue, in Transact. of Roy. Med. and Chirurg. Society, vol. xxxvi., p. 113.—*J. Hodgson*, Hypertrophy of the Tongue, &c., in Ibid., vol. xxxvi., p. 129.—*J. P. Teale*, Hypertrophy of Tongue, in Ibid., vol. xxxvi., p. 133.

TREMOR.—Synon.—Τρομός, Greek; *Tremor*, Lat. *Synclonus Tremor*, Good. *Tromos*, Swediaur. *Zittern*, German. *Tremblement*, Fr.; *Trembling*.

Classific.—4. *Class*, 3. *Order* (Good).—I. Class, III. Order (*Author in Preface*).

Definit.—*An involuntary, rapid, and feeble oscillation or agitation of some part of the body, or of the whole body, appearing primarily and without fever.*

1. Tremor has attracted the attention of the oldest writers on medicine. It has been noticed by Hippocrates, Celsus, Aretæus, and Galen. Aëtius and Paulus Æginета have devoted chapters to the consideration and treatment of it; and many modern writers have taken a more comprehensive view of its morbid relations, its symptomatic forms, and of the means of cure.

2. I. Description.—Tremor is very frequently a sympathetic and symptomatic affection. It is, however, sometimes a primary or idiopathic disorder, or one which can be assigned only to the state of the nervous system, or of the nerves supplying the part affected, either at their origins or in their course. The *character* or *form* of tremor varies much in different cases, and with the causes which produce it. Thus it may be merely a *slight* but *quick oscillation*, or a more marked and *rapid* movement, or *to-and-fro motion*; or it may amount to a *violent agitation*. It may present either of these features, and be also a *rotatory* or a *vertical motion*, especially when the head, eyes, lower jaw, or limbs are affected, and according to the muscles which are acted upon. It may, moreover, be only *temporary*, or of short or uncertain duration; or it may be *remittent*, or *intermittent*, or continue a very *long* time, or the *whole of life*, without apparently shortening the length of life. It may, in any of these, be either *general* or *partial*, as respects the frame. It may be a manifest and an important disease, or part of disease; or the patient may not evince any other disorder. In the latter case it may be viewed as idiopathic, or as constituting the complaint; in the former it is generally only a symptom. Although, when symptomatic especially, it varies its character, not merely as stated above, but sometimes still more remarkably, yet the oscillatory form, or to-and-fro motion, is usually preserved. The jerking and tremulous movements, which occur in other diseases, are observed chiefly in Chorea, in Shaking Palsy, in Ergotism, in Barbiers, and in Hysteria. In all these, however, the anormal motion is a symptom merely, is often more irregular, agitative, or spasmodic, than in tremor. The motions in this disorder are very quick and very limited or slight in extent, but always passive and usually very chronic, while they are in those diseases more active and acute. But many varieties of tremor, or modifications, are observed, and are to be referred chiefly to the causes of this affection. Tremor is rarely observed when the patient is sleeping, although he often starts in his sleep, and when he moves, the tremor is commonly very manifest. It is also increased after muscular efforts, or even during these; and by mental excitement, especially during anger or any feeling of temper. Depressing emotions of mind, the abstraction of accustomed stimuli, fatigue, inanition, &c., also increase the tremulous motions, or even extend their sphere in the frame liable to the affection.

3. II. Causes.—Tremor may arise from only one cause, or it may be the result of the concurrence of several. The causes which most frequently *predispose* to it are commonly such as depress or exhaust the nervous energy of a part, or of the whole frame. Of these the most remarkable are original and hereditary conformation, insufficient or improper nourishment during infancy and childhood, masturbation, premature or excessive sexual indulgences and other secret vices, unwholesome air, and the several depressing causes fully considered under the head Debility (§ 6). While many of these causes, especially when their operation is prolonged or excessive, may singly occasion tremor, others more commonly *excite* it, after the nervous system has become predisposed and susceptible. Of this latter class the most common are fear, fright, or terror; various moral sentiments, as passion, anger, excessive sexual desire, joy, &c.; contusions or injuries, succussions, concussions of the brain, falls, fatigue, excessive or prolonged muscular exertions, blood-letting improperly prescribed, or excessive discharges of blood, or inordinate secretion; the local injuries of nerves, inanition, or the abstraction of accustomed stimuli; and the abduction of animal heat in any way, whether rapid or prolonged. Most of these causes produce merely a temporary state of this affection. Those which follow more frequently occasion more prolonged or even permanent effects, although variously characterized, as mentioned above, especially as respects remissions, intermissions, or exacerbations. Those more influential causes are, the abuse of spirituous and fermented liquors or of narcotics; the excessive use of coffee or green tea; the use of tobacco in any form, especially when carried to excess; the fumes of mercury, arsenic, or lead, or the actions of those poisons in any form or way; various vegetable poisons;* sexual excesses, inordinate mental exertion, invermination, and the suppression of accustomed discharges, eruptions, &c. The most permanent states of tremor result from old age and the changes in parts, or in the whole of the nervous system from prolonged debauchery and dissipation, and from organic change in or near the origins or course of the nerves, or implicating the nerves of the affected parts. Many cases of tremor of the simplest and most permanent kind present no manifest cause, and can only be referred to the pathological causes just assigned, although many of the changes may be too minute or much beyond our senses to be detected.

4. Tremor has been divided into several *varieties* by some authors. Thus, J. Frank has adduced the following: 1st. The Inflammatory; 2d. The Rheumatic and Arthritic; 3d. The Gastric; 4th. The Atonic; 5th. The Nervous; 6th. The Metallic, or that caused by metallic poisons. Among the other divisions which have been assigned by writers, the following appear the most deserving of notice: 1st. Tremor senilis; 2d.

* I have at present an officer under my care who was poisoned in the north of India and recovered with difficulty. Although a large and strong-looking man, he has ever since been subject to tremor, which is much increased by and after excitement. The treatment about to be noticed has been employed with only moderate success.

T. potatorum; 3d. T. mercurialis; 4th. T. febrilis; and, 5th. T. paralyticus. The subject may be elucidated by a few remarks on these varieties.

5. (*a*) The *Inflammatory* of Frank would have been more correctly named the Congestive; inasmuch as the contingent occurrence of tremor is more frequent in congestive than in inflammatory affections of the nervous centres, and is more likely to take place from general or local vascular plethora, and from morbid condition of the blood, than from inflammation.—(*b*) The *Arthritic* and *Rheumatic* variety of tremor is not of frequent occurrence, and is an occasional symptom, oftener observed, however, during the earlier periods of convalescence from these diseases than during their course, and especially when those diseases have been neglected, or injudiciously treated by colchicum and other depressing agents.—(*c*) The *Gastric* form of tremor, contended for by Frank, is of rare occurrence; for although tremor may be often connected with gastric disorder, the former may no more depend upon the latter than the gastric disorder may depend upon the tremor—both states of disorder being merely concurrent manifestations of the condition of the nervous centres or nervous prolongations, either voluntary or involuntary.—(*d*) The *Atonic* and the *Nervous* varieties of this writer may be viewed as one and the same; for it matters little whether the efficient or immediate cause be debility, exhaustion, atony, or asthenia, general or local, since the effect is nearly the same, although the causes are generally very different or even opposite in their natures. (*e*) The *Metallic* and the *Mercurial* forms of tremor are distinctions which may be admitted as serving both to point out the cause and to suggest the treatment; but these terms fulfil this purpose in a very limited and insufficient manner; for tremor may be caused not by mercury only, but also by lead and by arsenic; and even not merely by metallic substances, but also by several vegetable poisons, as by aconite, conium, stramonium, &c.—(*f*) The *Senile* form of tremor requires no remark. It is in no respect different from the atonic and nervous.—(*g*) The *Paralytic* is identical with *Paralysis agitans*, and is treated of in the article Paralysis. It often varies in character from the slightest tremor to a more violent agitation, as above stated (§ 2).—(*h*) The *Febrile* is observed chiefly in periodic, and in low or nervous fevers, and especially in the far-advanced stages of these and sometimes of other fevers, or during convalescence from them. In these the tremour is indicative of depressed or of exhausted nervous power, especially of depressed or exhausted organic nervous power, and of some degree of alteration of the blood.

6. Tremor sometimes pertinaciously follows attacks of fever, especially those of a periodic type; and in some instances continues for a long period, even for months, exasperated, however, by exhausting or debilitating causes. A case of this description recently came under my care in a gentleman long resident in India, and often attacked by periodic fever. The tremor had been of very long duration; it was then his only ailment; and it was much increased by exhausting and depressing causes. It was ultimately removed by quinine, and tincture of sumbul. These cases of tremour are oftenest met with in persons who have freely lived.

7. (*i*) The most frequent form of tremor is that observed in *drunkards* and *smokers*, or in those who indulge in any of the fermented or *intoxicating liquors*, or in *tobacco* or *opium* in any form. In those persons the tremors are most observable in the mornings, or during the intervals between the abuse of any of the substances indirectly causing them, and are chiefly manifested in the extremities, especially the upper. The tremor in such cases may be either simple or associated with illusions of the senses, or with delusions of the mind. In this latter case the disease is essentially that which has been usually denominated *Delirium tremens*, and which I have described as Delirium with Tremor. But in the former, or when the tremor is simple, the affection may vary in its severity and characters, as already stated (§ 2), especially in the intervals between the abuse of the intoxicating agents; for the tremor generally either altogether ceases or is mitigated, as well as the usually attendant feeling of depression, sinking and anxiety, or internal misery, by recourse to the intoxicating cause. Hence the affection is perpetuated or increased, until it terminates in paralysis, insanity, convulsions, or fatal exhaustion of nervous power, with more or less marked disturbance of the excreting organs.

8. (*k*) One of the most important forms of tremor, although hitherto not mentioned by writers, is that which may be termed the *Hysterical*. It is merely a modification of the atonic or nervous state of the disorder, which may affect equally either sex; while the hysterical occurs chiefly in the female sex, and is a most obstinate affection, owing to its cause, viz., manustupration—a vice which, when once indulged in, is seldom relinquished, until either the mind or body, or more commonly both, are completely broken down. Hysterical tremor is variously manifested, most frequently in the eyes and eyelids, sometimes in the hands or in the motions of the head or lower jaw, occasionally in the lower extremities; and in this last case it is often associated with incomplete hysterical paraplegia. A case of hysterical tremor of the head and another of the lower jaw came under my observation some time ago; the former having been treated by Dr. N. Grant and myself. In both these the oscillations were horizontal.*

9. (*l*) The last form of tremor which I shall notice is symptomatic of *intestinal worms*; and although this form is merely a symptom, and even a rare symptom, of invermination, yet it deserves mention, as respects not merely this cause of tremor, but also the states of the nervous system, which characterize both the primary disorder and the sympathetic affection. In verminous tremor the organic nervous power is both depressed and susceptible of irritation, which is propagated from the involuntary to the voluntary muscles, chiefly of the abdomen and trunk. The few cases of this form of tremor that I have seen, have been in persons from whom either tape-worm or the long round worm has been expelled.

10. III. The nature of tremor may be inferred from the causes and circumstances of its occurrence. Unless when it proceeds from con-

* A remarkable case of tremor, resembling a pulsating motion, of the muscles of the throat, was some years ago attended by Mr. Liston and myself. The question was whether it was hysterical or aneurismal, as the movements were often synchronous with the contractions of the left ventricle. The hysterical nature of the case became more manifest; and the patient returned into the country, without having allowed us time to observe the farther progress of the case.

gestion at the origins of the nerves of the affected part, and even in such cases also, tremor must be viewed as an indication of impaired power of these nerves, owing either to some change of their most minute organization, or of those parts of the nervous centres in which they originate. That the state of the circulation in the capillary vessels of those parts, or even of the blood circulating in them, as well as change of the structures or tissues in the vicinity, may also occasion this affection, may be admitted, especially when we consider the circumstances in which it occasionally comes under our observation, especially in the last stages of nervous fevers, in various forms of delirium (as the delirium of drunkards), in some cases of poisoning by narcotics or intoxicating poisons, &c. In a few cases of hysteria, and in rare cases of intestinal worms, tremor is a prominent symptom; and is in these a sympathetic affection reflected upon some external or voluntary part or parts from the internal seats of irritation — uterine and intestinal — through the medium of the sympathetic or ganglial order of nerves.

11. IV. Prognosis. — Tremor often furnishes important prognostic indications. When tremor occurs in old persons, it sometimes is the forerunner of paralysis; and when it affects parts already paralyzed, it occasionally precedes returning health. Its appearance in an early stage of *fever*, or after the cold stage and during the period of increment, is an indication of severe cerebral affection; and in these cases, as well as its occurrence during or after the delirium of fevers, tremor is a dangerous affection. When it occurs in cases of *cerebral congestion*, it is a serious symptom; but much depends upon the circumstances of the case. In *gouty* and *rheumatic attacks* it is less dangerous, as long as the extremities or voluntary organs are alone affected; but when either disease has retroceded or been misplaced—internal or vital organs being attacked — and tremor appears in these cases, then the danger is imminent. If this affection be slight; if it depend upon excessive exertion, or upon inanition; or if it be of recent occurrence, it may be generally removed with the causes which produced it; but if it occur in habitual drunkards, smokers, or opium-eaters, or in the aged, and especially if it be associated with delirium, or illusions, or with delusions in persons addicted to *intemperance*, it either is not permanently removed, or if it be alleviated, it usually returns. Tremor is seldom or never cured when it is associated with *paralysis*, or when it appears in the *insane*. Although it is not a dangerous affection when it occurs in *hysterical females*, yet it is most difficult to cure, especially if there be reason to infer that masturbation has occasioned it, or the associated hysterical disorder. It is less serious when it is symptomatic of *worms*. It generally admits of removal when it has been caused by mercury; but it is cured with much greater difficulty when it has been produced by lead or arsenic; and, in many of these latter cases, it is often attended by great danger. Tremor in nervous persons, and in a slight or limited form, may continue for many years, or even to an advanced or very old age, when it is unassociated with any other disorder, and when the functions, both mental and bodily, are not impaired, or even not materially impaired.

12. V. Diagnosis. — Tremor may be mistaken for several complaints, which either nearly resemble, or are closely allied with it; or they may be confounded with it, more especially chorea, the cold stage of ague, the formative stage of continued or exanthematous fevers, shaking palsy, delirium tremens, the subsultus tendinum observed in the last stage of fevers, &c.—*a*. In *chorea*, and in some cases of *palsy*, caused by disease of the membranes of the spinal cord, the motions are very different from tremor. In the former disease, the motion is caused by an irregular and frequent jerk, or momentary contraction of muscles, now affecting one part, then another; while in the latter, there is no tremor when the patient does not exert any volition on the affected limb; but, as soon as he attempts to move that part, the movement is often tremulous, uncertain, and imperfect. — *b*. In *shaking palsy*, the tremor or shaking is constant, unless the patient is sleeping, when it is either absent or diminished, and the power of motion is impaired or lost, or nearly so. Sensation is generally but little affected.— *c*. In *delirium tremens* there is more or less tremor, generally of the hands, and often also of the lower extremities and tongue; but there are also illusions of the senses and delusions of the mind, and nervous excitement. But tremor is often caused by intoxicating fluids, without delirium being present; and in cases occasionally characterized by delirium, tremor is often experienced either before or after attacks of delirium, or it may continue during the intervals between those attacks. The *cold stage* of ague, or the *invasion* of continued fevers—the former especially—may resemble tremor. But in the cold stage there is a general feeling of cold, which is not present in tremor, while the motions of the former are more active, and more generally manifested in the frame than those of the latter, which are usually passive and limited to certain parts, or at least not so widely extended.—*d*. The *subsultus* of the last and most dangerous state of fevers cannot be mistaken for tremor, as the history of the case, and the nature and seat of the movement, are sufficient to distinguish between them. The tremor of the tongue, often observed in *low fevers* when this organ is protruded, as well as the tremor of the limbs on attempts at motion or progression, occurs only when volition is attempted, and is distinct from idiopathic tremor, which is always present; the former, or symptomatic, being a frequent attendant upon greatly impaired nervous power, and manifested only when voluntary motion is attempted.

13. VI. Treatment. — The means of cure should be selected with strict regard to the causes and pathological states occasioning this affection. When it is caused by mercury or other metallic poisons, the remedies advised when treating of these in the articles Poisons (*see* § 568, *et seq.*), and Arts and Employments producing disease, should be adopted.* Under this latter head the

* [In tremor caused by any of the metallic poisons, as lead, mercury, &c., the iodide of potassium will prove a very successful remedy, especially in connexion with warm sulphur baths, vapor baths, &c. The bath should be made by taking from ʒij. to ʒiv. *sulphuret of potassium*, mixed with 20 to 30 gallons of water.

A new method of eliminating metallic poisons from the system, by means of *galvanic electricity*, has lately been introduced into practice, and, it is said, attended with marked success. A metallic bath is insulated from every thing, and partially filled with acidulated water, to convey more readily the electric currents. The patient lies on a seat in the tub, insulated entirely from the tub. When gold, silver, or mercury is in the system, nitric or hydrochloric acid is employed; when lead is suspected, the acid

prophylactic measures that may be employed against the metallic poisons are fully noticed. *Sulphur* was strongly recommended for the tremors caused by mercury by Dr. LETTSOM; and *electricity* by DE HAEN, MANDUYT, and SIGAUD LA FOND, not only for the mercurial tremor, but also for tremor caused by other mineral poisons. ZACUTUS LUSITANUS advised *sulphurous* and *aromatic warm baths*, not only for those cases, but also for tremors produced by other causes. The treatment recommended by most writers for tremor has generally been either empirical, or been based upon the presumed nervous character of the affection. *Antispasmodics* were prescribed by MARTINI; *blisters* by MUYS; *musk* by STARK and BANG; the *oxide of zinc* by FISCHER; *opium* by THOMANN; *purgatives* by RIEDLIN; *cinchona* and its preparations by BOUCHER and FILLEAU; and the *chenopodium ambrosioides* by J. FRANK.

14. When tremor is occasioned by congestion or plethora of any part of the nervous centres, then recourse may be had to scarifications and cupping, or to the application of leeches, according to the circumstances of the case. If it be connected with gout or rheumatism, the remedies advised for these diseases are appropriate, but those which lower nervous power ought not to be adopted when this affection is symptomatic of these diseases. If it be caused by intoxicating fluids, the preparations of ammonia are generally most efficacious. When it is occasioned by cold, the warm bath, followed by frictions and ammonia, are indicated; and if these fail, cinchona, serpentaria, the calamus aromaticus, arnica, camphor, guaiacum, &c., may be severally employed. If congestion of the brain have occurred from this cause and produced the tremor, the arm or arms are most frequently the seat of the affection, and in this case cupping, leeches, a blister to the nape of the neck, or behind the ears, or even venesection if the patient be plethoric, as advised by SOLBRIG, may be prescribed. Cases have been recorded by ANDRÈ and others, which have recovered by means of a prolonged course of tonics conjoined with purgatives. Tremor may occur in such various, different, or even opposite circumstances and pathological conditions, whether appearing idiopathically or symptomatically, that it becomes impossible to state the means most appropriate to each of these, at least within the limits to which I am confined. In respect of this affection, as well as of most others, the physician must observe closely and judge for himself, selecting and devising his means with a strict reference to ascertained causes, and to inferred changes.

BIBLIOG. AND REFER.—*Hippocrates*, Prognos., ii., 24, lib. ii., epid. sect. 4.—*Dioscorides*, Facile Parab., l. i., c. 233.—*Celsus*, l. iii., cap. 25.—*Galen*, De Tremore, Opp. Cl. iii.—*Paulus Ægineta*, l. iii., c. 21.—*Avicenna*, Canon., lib. iii., Fen. 2, Fr. i., cap. 11.—*Forestus*, lib. x., obs. 99. (*Tremor Manuum.*)—*Tulpius*, l. i., c. 12. (*Tremor periodicus.*)—*Zacutus Lusitanus*, Prax. Admir., lib. i., 42.—*Fernelius*, Consil., No. 16, et seq.—*Camerarius*, Memorab., Cent. ii., n. 23; et De Tremore a cessanti Scabbie. Tub., 1688.—*Diemerbroeck*, De Trem. et Paralysi. Traj. ad Rh., 1652.—*Bellini*, De Morbis Capitis, p. 562.—*Hoechstetter*, Dec. iv., obs. 100. (*Tremor Pedum.*)—*Peeplin*, l. ii., obs. 32. (*T. Corporis Universalis.*)—*Bonet*, Sepulcret., l. i., sec. xiv., observ. 7, 9, 10.—*Riedlin*, Lin. Med., 1695, p. 101.—*Lentin*, Beyträge, p. 104. (*Scabie suppressa.*)—*Thomann*, Annales Wurceb., t. i., p. 46.—*Bang*, in Acta Reg. Soc. Med. Haun., vol. ii., p. 153, et p. 253.—*De Haen*, Rat. Med., P. iii., p. 202; et P. iv., p. 231.—*Van Swieten*, Comment., t. iii., p. 439.—*Bardin*, in Jour. Génér. de Médecine, t. xxxviii., p. 129. (*Caused by Mercurial Vapours.*)—*Soebrig*, in Horn. N. Archiv., b. ii., p. 333.—*Fischer*, Bemerkungen über London, &c., p. 172.—*Abrahamson*, in Meckel. N. Archiv., b. i., st. iii., n. 38.—*Sauvages*, Nosolog. Method., t. ii., p. ii., Class iv., Gen. 14, Sp. 4.—*Manduyt*, in Mém. de la Soc. Roy. de Méd. ad 1782 et 83, l., p. 160.—*Boucher*, in Journ. de Méd., t. xii., p. 23.—*Filleau*, in Journ. de Méd., t. xlix., p. 241.—*Merat*, in Journ. de Méd. Contin., t. viii., p. 390; et Mém. sur le Tremblement auquel sont sujettes les Personnes qui emploient le Mercure. Paris, 1804; et Dict. des Sciences Méd., t. lv., p. 517.—*J. Frank*, Praxeos. Med. Universæ Præcepta, t. iii., p. 227, 8vo. Lips., 1821.—*Chomel*, Dict. de Méd., 2d edit., art. *Tremblement*.

used is sulphuric. The negative pole of a battery is put in connexion with the bath, while the positive pole is in the hands of the patient. The metal is conveyed from the system, it is said, and deposited on the sides of the bath. Establishments for this purpose have been recently opened in our principal cities. Dr. TODD also speaks highly of galvanism for the same purpose in his recent "Clinical Lectures on Diseases of the Nervous System." Philad., 1855.—*Ed.*]

TUBERCULAR CONSUMPTION.* — SYNON. —*Phthisis* (φθισις, from φθω, I waste or decay), Hippocrates, Pliny, Juncker, Vogel, Sauvages, Cullen, &c. *Tabes*, Celsus. *Phthoe*, Hippocrates. *Phthisis pulmonaris*, *Phthisis pulmonalis*, *P. scrofulosa*, Frank, Pinel, &c. *Ph. pulmonalis tuberculosa*, *P. scrofulosa*, Auct. *Affectio Phthisica*, Hoffman. *Hectica Phthisis*, Young. *Marasmus Phthisis*, Good. *Exulceratio pulmonum*, *Consumptio pulmonum*; Lungensucht, Schwindsucht, Lungenkrankheit, Germ. *Phthisie pulmonaire*, Fr. *Tisi pulmonare*, Ital. *Tisica*, Sp. *A phthisic, consumption, decline, pulmonary consumption, Tuberculous Phthisis.* CLASSIF. — 1. *Class*, 4. *Order* (Cullen). 3. *Class*, 4. *Order* (Good). IV. CLASS, II. ORDER (*Author in Preface*).

1. DEFINIT.—*Unusually quick respiration on slight exertion, short cough, hectic fever, and emaciation: expectoration at first wanting or scanty, afterward varying with the progress of disease, sometimes streaked with blood, or attended by more marked hæmoptysis: colliquative perspirations and diarrhœa, or both alternately, generally supervening or hastening dissolution: usually occurring in the scrofulous diathesis.*

2. PATHOL. DEFIN.—*The infiltration of tubercular matter in parts of the lungs; the morbid deposit undergoing metamorphosis, most commonly softening and more complete solution, followed by erosion of the containing tissues, by ulcerating cavities, by successive changes in adjoining parts, especially by vascular congestion, sanguineous exudation or extravasation, or inflammatory action generally limited to the adjoining structure and to the bronchial canals communicating with the tubercular formations.*

3. In addition to the above *symptoms* and *lesions characterizing tubercular consumption*, there are many others less commonly present, that can be comprised only in a more detailed description of the several forms and stages of the disease. Of these sufficient notice will be taken in the sequel. Some of the topics more fully considered in the articles SCROFULA and TUBERCLES will here receive a passing notice, in as far as they are more especially connected with pulmonary phthisis. The intimate connexion of scrofula and tubercular formation, in all cases, and their actual identity as respects especially their causes and constitutional relations, have been fully discussed under the heads just referred to (*see* SCROFULA and TUBERCLES, § 112–119, *et pluries*). It

* [The additions to the present article will be chiefly found in the Appendix at the end, to which the reader is referred.—*Ed.*]

is therefore unnecessary to advert to these topics in connexion with tubercular phthisis, especially as they will be made apparent during the description of the causes and organic changes of this malady.*

4. The *forms* and *states* of pulmonary consumption—of tubercular disease, affecting chiefly the lungs—and the numerous complications or morbid associations, either developed in the course of this malady, as contingent and intercurrent affections, or existing in the frame as latent or as manifest disorders from the commencement, severally require due recognition and diagnosis, and claim the especial investigation and study of the physician. The early aberrations from health which indicate the commencement of tubercular phthisis have been, during the greater part of the period of which my experience is cognizant, either imperfectly estimated or overlooked, while undue attention has been, and still is, directed alone to that which, although fully deserving a due portion of attention, should not receive an undivided investigation—to *physical diagnosis* in the several forms and methods, in which it has recently been paraded, over-estimated, and lauded. Owing to this one-sided study, to the fallacies inseparable from its nature and to those which arise from varying conditions of vital influence and action, from different states of secretion and excretion, from numerous disturbing causes appearing contingently, and from habits of dogmatizing with the view of exhibiting a precision of aquirement and knowledge beyond what has been previously reached, the cultivation, if not the advancement of physical diagnosis, to the neglect of the intimate observation of constitutional and physiological changes, has been generally attempted. Manipulations which strike the senses of the attendants, and more than one sense of the patient—examinations which may be seen, felt, and talked about, have a much more impressive and lasting influence upon both patient and spectators, than the close observation of symptoms and the pertinent inquiries of the profound and comprehensive thinker. The former are lights which the possessor places upon an eminence for his own advantages; the latter are lights intended entirely to benefit the person for whose safety they are employed. The one method strikes and impresses the patient and those around him, the other is, at best but imperfectly estimated, or even altogether unheeded.

5. Auscultation, which is of great service in the progress of phthisis, is much less advantageously employed at the commencement and even during the early stage of the malady. Too great dependence upon, and a too *ad captandum* parade of, this mode of diagnosis, sometimes even with the fussiness and the flourishes of vulgar craft, have tended to the neglect of those states of vital manifestation, of disordered functions, and of vascular action, which, while they indicate incipient or early pulmonary disease, also characterize its forms, and point to the changes in which these forms originate, and on which they continue more or less to depend. The presence or absence of certain sounds on percussion or auscultation, the states of development and of mobility of the several regions of the thorax, both individually and in relation to each other, are all of great importance in themselves, but this importance is heightened when they are viewed in connexion with their causes and with existing conditions of vital manifestation, of morbid function and of vascular action.*

6. The usual modes of physical diagnosis in respect of tubercular consumption have been sufficiently described, illustrated, practised, discussed, praised, and confided in, since the days of LAENNEC to those of SKODA, which nearly mark the period comprised by my experience; but they have not always been received as immutable truths. What was confided in by the batoned followers of LAENNEC is now disputed by the skeptical followers of SKODA. Doctors proverbially differ; but professed adepts as certainly disagree, and that the disagreement may not be the less marked and continued, the one school misinterpret or misrepresent the dogmas of the other. As among the microscopists, so among many of those who pretend to the greatest powers of auscultation—who split hairs in auscultatory diagnosis—the greatest differences occur, in the early stages of phthisis especially. What is heard by one is often not heard at all, or heard differently by another; belief frequently rendering the sense of hearing more acute and the physical signs more distinct. Not infrequently the adepts—the *specialists* of this malady, the would-be the greatest authorities, the infallible in this department of *speciality*—find evidence of tubercles in the lungs on auscultation and percussion, where none exist, or have existed, or could be detected after death.†

* [From the various analyses of tubercle given by different authors, it appears that it consists, 1st, of an animal matter mixed with certain earthy salts, the relative proportions of which vary in different specimens of tubercle, animal matter being more abundant in recent, and earthy salts in chronic tubercle; 2d, that the animal matter contains a large amount of albumen (*casein*, *fibrin*, and *fat* have also been detected in small but variable proportion as constituents of tubercle); 3d, the earthy salts are chiefly of the insoluble phosphate and carbonate of lime, with a small proportion of the soluble salts of soda; 4th, that very little difference in ultimate composition has yet been detected between recent tubercle and other so-called compounds of protein. VOGEL, however, states that the chemical composition of tubercle is at present unknown ("*Path. Anatomy* of the Human Body." Phil., 1847), and all that is positively known regarding it is, that it is a protein compound. During softening, the same writer states that chemical changes occur, the phosphorus and sulphur diminishing, till at last they wholly disappear. The experiments of SCHERER seem to show that tubercle in different cases presents a different composition, and is not always identical with protein.—(*Simon's Animal Chem.*, vol. ii., p. 478.) It is admitted by all that, in addition to the protein compounds, tubercle contains various salts, fat, extractive matters, and a substance resembling pyin—the calcareous salts predominating when the tubercles become changed into concretions, leaving but about three per cent. animal matter.—(*Thenard.*)—*Ed.*]

* [DR. CAMMANN, of New York, has invented a stethoscope which possesses many advantages over those in ordinary use. In cases of suspected tuberculosis, in which tuberculous deposits are either wanting or are small and disseminated, we are able, by means of this instrument, to make a closer comparison of the respiratory sounds than with the naked ear or the ordinary cylinder. "A disparity, therefore, on the one hand, is in some instances rendered appreciable which otherwise would not be discovered; and, on the other hand, the absence of a disparity and the completeness of the normal characters are more satisfactorily determined than is always practicable without this improved means of auscultatory exploration. It enables the auscultator to study the characters of the respiration in some cases in which it is so feeble as to be with difficulty appreciated by the ordinary cylinder or by immediate auscultation. Its usefulness, in cases in which it is desirable to make nice comparisons with respect to vocal phenomena, is not less than in examinations with reference to respiratory sounds. These advantages render the instrument particularly serviceable, both in a positive and negative point of view, in the diagnosis of pulmonary tuberculosis."—*A. Flint.*]

† [We fear that sarcasms in regard to the use of the

7. I. As to the ORIGIN OF TUBERCLES, I must refer the reader to that article (*see* SCROFULA and TUBERCLES); but I may here remark that much has been written upon this topic in former days, and at the present time it still remains a "*quæstio vexata.*" At an early epoch of pathological speculation respecting it, the formation of tubercles was imputed to impaired vital influence, and afterward to depressed nervous energy. At a more recent period a morbid nutrition obtained credit for the mischief, although it might have been difficult to show how nutrition, however morbid, could have formed what was admitted to be neither organized nor organizable. Then it was attempted by ROKITANSKI and his admirers to describe tubercles as transitions from organized to non-organized formations. Still more recently the origin of this formidable malady was laid in the blood; and if the actual existence of the tubercular matter could not be detected in the circulation by the far-seeing—or rather near-seeing—microscopists, after the most minute search, the elements of this matter doubtless existed. Upon this latter inference they could safely count. Indeed, this part of the conclusion could hardly be denied; for, where vascular assimilation is deficient, the materials for morbid formations must necessarily abound; and the development of such formations will necessarily most readily take place in situations and structures most favourable to the morbid process, and most exposed to the influence of the causes which predispose to, or produce it. When organic nervous power is impaired, vascular assimilation and healthy nutrition must necessarily suffer; and those tissues and organs which are the most disposed by function and organization, and as respects their capillary circulation and their normal secretions, to experience the early effects of these changes, will be the first to manifest disease, and the most likely to experience disorganization.*

8. Dismissing, however, the consideration of this topic, and referring to what I have advanced respecting it under its appropriate head, I shall now very briefly advert to the constitutional states in which the formation of tubercles in the lungs generally takes place, and with which they are more or less intimately allied during the greater part or the whole of their progress. These states have been very imperfectly described and distinguished from each other, both in health and in disease; the great difficulty of assigning distinctions, arising from their mixed characters, the manner in which they pass into one another, and the association of temperament, diathesis, and habit of body being often such as to obscure the subject, and to render precise and accurate observation almost impossible. Nevertheless, these states have a more or less intimate relation to the forms or varieties of tubercular phthisis, and should hardly be separated from a due consideration of the influence and modus operandi of the predisposing and exciting causes. Certain of these, especially the scrofulous diathesis, and very probably this only, have a most intimate connexion with the pulmonary disease, while others are much more doubtfully, or even are in no ways, related to it. They should, notwithstanding, be viewed in connexion with the causes, the courses, the morbid associations, and the inter-current affections of tubercular phthisis. The imperfect attention which has hitherto been directed to this part of the subject must be my apology for the insufficient discussion of it at this place, my object being rather to indicate than to supply the deficiency: to this latter end precise observation and patient research are altogether wanting.

9. i. *The scrofulous diathesis or taint* is the most common constitutional condition in which phthisis occurs. It is that intimate organization of frame which results from those predisposing causes, referable to the parent and to the infancy of the offspring, and which, with these causes, I have described when treating of SCROFULA and TUBERCLES (*sec* § 3, *et seq.*). But although it is most frequently the basis of the tubercular formations in the lungs, whether latent or developed—the soil in which they grow—yet these formations may appear in other conditions of the frame than this, when the predisposing and exciting causes are in energetic or concurrent operation. In this condition, however, the tubercular formations in the lungs are most prone to pursue their usual course, especially after the age of puberty, and before the period of middle age. They may also assume the acute form, especially in the plethoric, and when their causes are more than usually active.

10. ii. *The lymphatic temperament* has been supposed, especially by French pathologists, to predispose to phthisis more frequently than any other temperament or diathesis, excepting the scrofulous. This may be the case, for I am not prepared to dispute it; but if the question be put as to what constitutes the lymphatic temperament, and as to what signs this temperament may be recognised, but few will agree in the answer, or be prepared to answer it at all. This much may be said respecting it, that it is very closely allied to the scrofulous taint or diathesis; that the lymphatic system is prominently developed in persons possessing it; and that the lymphatic glands and serous membranes in those persons are very prone to become the seats of tubercular deposits, whatever may be their complexions or races.

11. iii. *The melancholic, phlegmatic, and bilious temperaments* do not predispose to phthisis. When this malady occurs in either of these constitutional conditions, it is generally caused by

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microscope, instead of serving any useful purpose, will only serve to excuse indolence and depreciate the value of physical diagnosis among practitioners. It is in the highest degree important that medical men should be able, if possible, to detect the existence of this disease in its early stages, when, by proper hygienic means, it is often within our control, and no means of diagnosis which furnish *any* aid towards that object are to be neglected.—*Ed.*]

* [Sir JAMES CLARK, Dr. BENNETT, of Edinburgh, and many other writers on this disease, have called attention to the fact that it is usually ushered in or preceded by derangement of the digestive organs, indicated by furred tongue, capricious appetite, acidity and anorexia, constipation alternating with diarrhœa, and that the same symptoms, in a majority of cases, accompany phthisis throughout its progress, becoming more and more violent towards its termination. It is therefore reasonable to believe that, as the nutritive properties of the blood are entirely dependent on a proper assimilation of food, and as this assimilation is interfered with in the morbid conditions of the alimentary canal, the continuance of such conditions necessarily induces an impoverished state of that fluid, and imperfect growth of the tissues. When, under such circumstances, exudations of the liquor sanguinis occur, they are very liable to assume the form of tubercles, and if they are poured into the lungs, there are then produced those changes and that condition called pulmonary tuberculosis. *See a Treatise on the Pathology and Treatment of Pulmonary Tuberculosis, and on the Local Indication of Pharyngeal and Laryngeal Diseases frequently mistaken for or associated with Phthisis*, by J. H. BENNETT, 8vo, p. 130. Phil., 1854.—*Ed.*]

several concurrent influences, and it frequently assumes a very protracted form, or it remains long latent before it is openly and fully manifested. It may then be far advanced, and either assume in this state a chronic form, or proceed rapidly to the usual termination. It is often, however, very difficult to determine the diathesis and temperament of persons labouring under phthisis, especially in its advanced stage; and the comparative tendencies of either temperaments, diathesis, or habits of body, to this disease, have not been ascertained with a sufficient precision to enable me to state any thing with confidence on this topic.

12. iv. *The nervous, the irritable, and choleric temperaments* present no very marked predisposition to phthisis, although this malady may appear in either of these temperaments when the causes are energetic. In these the disease is prone to assume an acute, rapid, and febrile character, or to be associated with bronchitis or laryngitis; and, in the nervous temperament especially, it may, in its early course, present many of the characters of nervous fever, or, in children, of remittent fever. In either of these constitutional states various complications may occur in the progress of the disease, affecting either the lungs or other organs. Although hæmoptysis may take place in either of these, it is not so frequent in them as it is in the sanguineous temperament, or in the scrofulous diathesis.

13. v. *The sanguineous temperament* is probably more disposed to phthisis than those last noticed (§ 11, 12); but it is more especially so disposed when it is associated with the scrofulous diathesis. It is then apt to favour an acute or febrile form of the malady, which is frequently complicated with hæmoptysis, with pneumonia, and various other lesions of the lungs and pleura. As respects this temperament, as well as the others, a more precise observation of phenomena from the commencement to the termination of phthisis, in a wider field of observation than I have possessed, is required to illustrate this part of my subject, and to render it available to practical purposes.

14. II. DESCRIPTION OF TUBERCULAR CONSUMPTION.—In describing tubercular consumption, or phthisis pulmonalis, I confine myself to the phenomena produced by the formation of tubercles in the lungs, although I do not overlook the fact that tubercles often exist in other organs when they are formed in the lungs, especially in young subjects. Of this circumstance notice will be taken in the sequel. Pulmonary phthisis may be viewed as a vital blight, which in the animal kingdom as in the vegetable, affects the circulating fluids by attacking the organs of assimilation and respiration. Numerous vital and physical causes, severally or concurrently, produce this result; while many influences, occasioning either excessive waste or imperfect supply of assimilating or nutritious elements, exert a similar effect.

15. *Phthisis* may present numerous variations in its course. M. LOUIS states that he has seen it prove fatal within a period varying from three months to twenty years; and the tendency of the disease to cause a simultaneous or successive formation of tubercles in different parts of the system is one of the chief reasons of these variations. I have met with cases, the duration of which has been even much longer than just now mentioned, and I will make a more particular reference to them in the sequel. The very different or varied occurrences and lesions, which may take place in the early course or advanced progress of phthisis, independently of the influence of *diathesis* and *temperament*, are such as to vary most remarkably the character of this disease. The development of tubercles in different tissues and organs; the progress of tubercular deposit, and the form of tubercles; their softening, and the excretion or absorption of the tubercular and morbid matters; intercurrent inflammations, bronchial irritations, or pleuritic attacks; the occurrence of hæmoptysis, its frequency or amount; attacks of laryngitis, tracheitis, or ulceration either in those situations or in the bowels, with many other contingencies, either severally or in combination, impart a marked diversity in the characters, course, and duration of this malady. In order, therefore, that these variations, with their most frequent sources and contingencies, may receive sufficient attention, I shall notice, 1st. *The more usual form of tubercular phthisis;* 2d. *The latent form of phthisis;* 3d. *The primarily acute form of phthisis;* 4th. *The consecutively acute form;* 5th. *The protracted form of phthisis;* 6th. *Of phthisis in infancy and childhood;* and, 7th. *Of phthisis in the dark races.*

16. Having considered the *forms* or *variations* of the disease as fully as my limits permit, I shall afterward take a brief view of the complications and intercurrent lesions which may appear in the course of these forms, more especially of, 1st. *Bronchial irritation and inflammation;* 2d. *Hæmoptysis in its several states;* 3d. *Inflammation, ulceration, œdema,* &c., *of the larynx, trachea,* &c.; 4th. *Inflammations or congestion of the lungs, or of the parts surrounding tubercular deposits,* &c.; 5th. *Inflammations of, effusion from, and adhesions of the pleura;* 6th. *Perforation of the pleura, pneumathorax, and hydro-pneumathorax;* 7th. *Diseases, especially ulceration of the intestines;* 8th. *Fistula in ano;* 9th. *Disorders of the uterine functions and organs;* 10th. *Diseases of the kidneys and urinary organs generally, and their consequences;* 11th. *Diseases of the heart and pericardium;* 12th. *Abnormal states of the blood and blood-vessels, at the commencement and at the successive stages of phthisis.*

17. i. OF THE MORE USUAL FORM OF TUBERCULAR OR PULMONARY PHTHISIS.—At its commencement phthisis may be manifest to the close observer, or it may be inferred with uncertainty, or detected with the greatest difficulty. But, as it advances, it generally becomes evident to the most careless observer. The diagnosis, however, should have reference not merely to the existence of this disease, but also to the progress it has made, as shown by the nature and combination of the symptoms and signs during its course. The division of its course, therefore, into *periods* or *stages*, according to the progress and extent of the pulmonary and associated lesions and to the nature of the symptoms, is of much importance, not only as imparting a greater precision of description, but as suggesting more appropriate indications and means of treatment.

18. *A.* FIRST STAGE.—*a.* In some cases before the respiratory functions indicate any disorder, but in others either contemporaneously with, or soon after such disorder, the habit and appearance of the body evince more or less of falling off

from the healthy condition. Cough and shortness of breathing, slight at first, and hardly observed, are early experienced. The cough is at first short, slight, occurring only in the morning when leaving the bed, consisting only of a slight hack, and afterward recurring only occasionally or more and more frequently in the course of the day, or upon exertion. It is at first dry, or attended by a slight, ropy or saliva-like fluid. The respiration, either previously, subsequently, or about the same time, is quick or hurried on the slightest exertion, and becomes more remarkably short as the cough continues or becomes frequent. At this period, or even previously to either cough or shortness of breathing being experienced, the patient's spirits, in some cases, are much depressed, and the pulse is weak and slow. This is more particularly remarked when the disease is produced or determined by exhausting or depressing causes, as masturbation or depressing mental emotions. In many cases, the pupil of the eye is much dilated, and the conjunctiva pale or pearl-like. Pallor of the countenance and a deficiency of the carnation tint of the general surface are also often observed, while the flesh is softer than natural, and somewhat emaciated. There are a general indication of languor, and a want of the elasticity of mental and bodily health.

19. These symptoms may continue for some time, without making much progress, or they may become more marked, but they are, after a longer or shorter time, according to the states of season, weather, climate, and numerous other influences, followed by greater and more general disturbance. The pulse becomes quicker than usual, especially towards evening or after meals. A chilliness, or sense of coldness, going down the spine, is experienced early in the day and again towards evening, followed by an increased heat of skin, the evening chill and heat being most complained of. The febrile paroxysm at noon may be slight, and thus overlooked, but that in the evening is attended by greater heat of skin, particularly of the palms of the hands and soles of the feet, which continues during the night, perspiration occurring towards morning. Owing to this febrile condition the patient is restless, and sleep is less sound and refreshing; cough often occurring during the night, when turning in bed, and as the disease advances. The patient readily flushes on any excitement, or after a full meal; and a tightness or oppression of the chest, or transitory pains, especially near the collar bones, are often experienced. The bowels are not much disordered, or are somewhat confined; the urine is not materially affected. The female discharges are at this stage not necessarily deranged; but they may be either excessive in quantity or frequency, or they may be scanty, difficult, or suppressed, or replaced by leucorrhœa; these disorders often accelerating, the last affection sometimes delaying, the progress of the malady.

20. Climate and weather, aided by various circumstances, very remarkably influence the progress of this stage, especially when aided by judicious treatment. With the advance of spring and summer, in this and temperate countries, the malady often appears arrested, and the general health improved. The patient sometimes gains flesh and strength; but cough and shortness of breathing seldom entirely disappear; and as autumn advances and winter returns, they become exasperated upon the slightest exposure, or even without any known exposure, and the other symptoms also are aggravated, periods of exacerbation and of relief sometimes taking place irregularly, and tending to retard the progress of this stage, or even to carry it on to the following spring and summer, if the second stage have not previously supervened.

21. *b. This first stage* of tuberculous phthisis corresponds with the first stage of tubercular development. The lungs at this period contain a greater or less amount of tubercular deposit in what has commonly been denominated a state of crudity. The tubercles are generally of two kinds, as described in the article SCROFULA AND TUBERCLES (§ 71, *et seq.*); the one more or less firm, grayish, and somewhat transparent; the other of a pale yellowish colour and opaque. At this stage, the adjoining pulmonary tissue and bronchial membrane may not have undergone any perceptible alteration, or both may present more or less redness or vascular congestion. If *hæmoptysis* have occurred in this stage, which is very frequently the case, and which I shall notice more particularly hereafter, these changes are generally present in a more or less marked degree. The symptoms thus indicating the first stage of tuberculous phthisis chiefly are, slight cough, shortness of breathing, languor, loss of the healthy colour of the surface, commencing emaciation and flabbiness of the flesh, slight hectic fever, and the state of the eyes already mentioned.

22. *c. The physical signs* in this stage are very often obscure. This, however, depends much upon the form in which the tubercular deposit exists in the lungs—whether or no in that of isolated granules or as a continuous mass infiltrated through the parenchyma. Isolated tubercles may be so minute as almost to escape observation; or they may render portions of the lung impermeable to air, either by enlarging and approaching each other, or by the formation of more recent tubercles between them. While the solitary tubercles are separated from each other by healthy tissue, physical signs may be absent or obscure; but when portions of the lung are impermeable to air by infiltration of tubercular matter, or by the development of solitary tubercles, these signs are rendered more or less manifest, especially in proportion to the greater or less extent and rapidity of the respiratory movements. The quantity and quality of the secretions formed in the bronchial tubes have, however, great influence on the nature of the physical phenomena.

23. *d. Solitary tubercles* do not, of themselves, produce the slightest change in the *percussion sound* of the lungs, even although they be scattered throughout the organ in considerable number. Any change of this sound depends upon an altered state of the portions of lung between these tubercles: the sound is tympanitic when the intervening tissue has lost its contractility; but the infiltration of blood, serum, &c., into the tissue, whereby the air is expelled from it, renders the sound dull. As long as the intervening tissue continues normal the sound continues normal; but it is less sonorous, if the tissue be more dense and hypertrophied than natural. SKODA disputes the statement of Dr. STOKES that solitary tubercles, when very abundant, produce a somewhat dull percussion sound. When they do so, the intervening tissue is then most probably congested or infiltrated.

24. *e. On Auscultation* the signs of *solitary tu-*

bercles are often indefinite, owing to their number, development, and the state of the bronchial mucous membrane. The inspiratory murmur may be distinctly or loudly vesicular, or it may be indistinct or altogether inaudible, though unaccompanied by râles, or whistling, or sonorous sounds. Râles of every kind, as well as whistling and sonorous sounds, may be mixed with the vesicular or indeterminate inspiratory murmur, or râles or whistling sounds alone be heard. The expiratory murmur may be altogether inaudible, or as loud and strong as that of inspiration, and, like this, be associated with râles, and whistling, and sonorous sounds.—Skoda.

25. As the deposit of tubercular matter increases, "and in many cases even at its first deposition, swelling of the bronchial mucous membrane, accompanied or not by secretion, takes place, and then the same auscultatory signs appear as those described under the head of catarrh. The slow development of tubercles almost invariably takes place in the upper parts of the lungs, and hence, in such cases, we frequently find the auscultatory signs of catarrh permanent there, the respiratory murmur being elsewhere healthy. Rapidly developed tubercles, however, do not manifest themselves in the first instance at the apices of the lungs, but are frequently scattered equally throughout the whole of a lung, or of one lobe."* Skoda considers that there are no distinct signs by which the existence of acute miliary tubercles can be diagnosed. Dr. Stokes states that "if in a case presenting the signs and symptoms of severe bronchitis, or in which we observe a crepitating râle continuing without intermission, we find incomplete dulness over a considerable extent of the surface of the thorax, unaccompanied with bronchial respiration; and if the stethoscope shows that the lung is almost every where permeable to air, and obstructed only at certain places, or if the crepitation be too feeble to account for the dull percussion sound, we may diagnose the acute inflammatory development of tubercle." According, however, to the experience of Skoda, most cases of acute tuberculosis are unaccompanied by any of those signs, and every one of them may be present without the disease being tubercular.

26. *f. Tubercles in Masses and tubercular Infiltration.*—*a.* In by far the greater number of cases of tubercular disease of the lungs, of some duration, the *percussion sound*, under one or both clavicles, is duller and emptier than natural, or is completely dull, while over the other parts of the thorax the sound is normal, or louder, or duller than ordinary. This is owing to the conglomeration of tubercles in the upper parts of the lungs, where they are slowly developed, increase in size, and, coming in contact with each other, form considerable masses. Tubercular infiltration also occurs in the form of a slow process of development in the upper parts of the lungs, and then gives rise to this change of sound under the clavicles. Generally, when the sound under the clavicles is duller than natural, it is abnormally loud in the natural regions of the thorax, the lower part of the lung being more than usually distended, owing to respiration being impeded above. Acute tubercular infiltration takes place most frequently in the upper lobes of the lungs. It produces the same percussion sound as hepatization.

[Dr. H. J. Bowditch, of Boston, has reported eight cases where the tubercular deposit commenced near the base of the lung and extended upward; and he estimates that these exceptional instances are liable to occur in a ratio of 1 to 150 or 200 cases. The instances observed by him were characterized by a well-marked crepitant râle behind, over the lower lobe, persisting for weeks or months, followed by the physical signs of solidification, the disease finally extending to the upper lobe, affecting both sides, and advancing to the formation of cavities, as in the ordinary form of tuberculosis. The symptomatic phenomena in these cases did not present any material variation from those usually observed in phthisis. The diagnosis involves discrimination from pneumonitis. The physical signs are common to the two affections, but with this essential difference: in the tuberculous affection the crepitant râle persisted for weeks and months, solidification being slowly induced. Moreover, the history and symptoms of the case differ essentially in the two diseases. Exploration for phthisis should, therefore, not be limited to the upper part of the chest.]

27. *g. Auscultatory Signs.*—As long as the tubercular mass, or the tubercular infiltration, is of such limited extent as not to contain within it at least one large bronchial tube, it will not give rise either to bronchophony, or to bronchial breathing, or to any consonating sound. "Vesicular respiration may continue audible beneath the clavicles even when tolerably large masses of tubercles are present in the upper lobes of the lungs, provided there be sufficient healthy tissue to produce it, and the bronchial mucous membrane be not swollen nor covered by secretion. But this is not generally the case, for we almost invariably hear an indeterminate inspiratory murmur, of different degrees of strength, often, indeed, very strong, and in most cases attended by moist râles, or by hissing, whistling, and sonorous sounds; the expiratory murmur is nearly as loud, or even louder, than the inspiratory, and is likewise combined with different kinds of râles, and whistling and hissing sounds."—*Op. cit.*, p. 302.

28. If the tubercular masses or infiltration be of such extent as to embrace bronchial tubes, in which the voice or the respiratory murmur can consonate, bronchophony and bronchial breathing will be heard beneath the clavicles, provided the tubes are not filled by fluid or solid exudations, and should there be any râles, or whistling or sonorous sounds in the trachea, or in a large bronchial tube, consonating râles, or whistling or sonorous sounds, will also be heard. But if the bronchial tubes in question be obliterated, neither bronchophony, nor bronchial breathing, nor any consonating râles, will be audible, these being replaced either by indeterminate respiratory murmurs, with or without dull râles, or no murmur whatever. It is often observed, owing to the bronchial tubes being at one time filled or obstructed by mucus, and at another freed from it by coughing or expectoration, that in the course of a few minutes bronchophony is heard alternating with a dull resonance of the voice, bronchial respiration with indistinct breathing, and a clear acute with a deep dull râle, &c. Consonating and non-consonating sounds may be also heard at the same time.—Skoda.

* *A Treatise on Auscultation and Percussion by Dr.* Joseph Skoda; *translated from the fourth Edition, by* W. O. Markham, *M.D.*, p. 300.—The best authority on Auscultation.

29. Should the tubercular masses or infiltration not be developed in the upper lobes, the respiration beneath the clavicles may be quite natural, auscultatory signs being presented over those parts of the chest which correspond with the affected portions of lung. The parts which are healthy, or which contain only solitary tubercles, yield either a weak or loud vesicular or indeterminate respiratory murmur; or every variety of râle and whistling and sonorous sounds may be audible, according as the bronchial tubes are or are not free from catarrhal affection. "There are no auscultatory signs pathognomonic of tubercular disease of the lungs; and there are none which will enable us to determine that no tubercle is present in a lung, or in any part of it."—Skoda.

30. *h.* Of the *physical signs* in this stage, it may be said that, unless there is an obvious difference between the sounds emitted in the relative situations on opposite sides, these signs are not much to be depended on; and in very many cases an opinion as to the disease has to be formed chiefly from the local and constitutional symptoms. In other cases, with the same symptoms, the physical signs afford unequivocal indications of the existence of tubercular disease. The sound elicited by percussion is evidently less clear under one clavicle, the respiration less soft and easy, and the voice decidedly more resonant than under the opposite clavicle. And, even at this early period, the motions of the upper parts of the chest during respiration may often be seen to be unequal; one side of the thorax being more fully expanded during inspiration than the other, the side least elevated being generally that which furnishes the most evident signs of the presence of tubercles. When tubercles are diffused over a large portion of the lungs, a degree of puerile respiration occasionally indicates their presence. "A marked inequality in the sound of the respiration in different parts of the chest also affords strong suspicion of tubercular disease, when such inequality cannot otherwise be accounted for."

31. *B.* Second Stage.—*a.* The transition from the first to the second stage may be gradual and hardly manifest, or it may be rapid and evident. It is indicated chiefly by a change in the expectoration. The sputum, instead of being colourless, slightly grayish and frothy, either becomes muco-puriform and contains specks or streaks of blood, or presents minute specks of opaque matter, of a pale yellow colour. These specks gradually increase in number and in size, until they form curdly patches, surrounded by the transparent portion of the expectoration. The increased sputum is accompanied with more frequent, often more severe cough; the chills or sense of cold running down the spine, the evening heat of skin, the restlessness in the early part of the night, and the morning perspiration, although more severe on some days than on others, or on alternate days, become more remarkable; and hectic fever is unmistakably established. The pulse is always accelerated, more especially in the evening; the respiration quick, although the patient be at rest; and the emaciation and flabbiness of the flesh increase. Languor, debility, and an inability of bodily and mental exertion, are experienced. The face is generally pale in the morning, but it becomes flushed after a meal, and in the evening, when the fever and heat of skin are present, the flush in the cheeks being more and more circumscribed as the disease advances. The pains sometimes complained of in the first stage are more frequently felt in this, and are referred most commonly to the vicinity of the collar-bones, or to one or both shoulders, occasionally to either side, and not infrequently to the back, or to one side of the upper half of the sternum. The pain is generally dull or aching, resembles chronic rheumatism; but it is sometimes acute, especially when it is referred to either side, and is then owing to the extension of inflammatory action, of a sub-acute or chronic form to the pleura. Before, in some cases, and more frequently after, this stage is formed, slight or more decided hæmoptysis occurs. In many instances the expectoration is merely streaked with blood, in others the blood is discharged in considerable or large quantity, and unmixed with the sputum.

32. *b.* These symptoms are occasioned by the *softening* of the tubercular matter, and by the changes in the parenchyma of the lungs and in the bronchi which attend it. The softened and diffluent matter, forming the expectoration, proceeds from the dissolution of the tubercles, from the tissues surrounding them, and from the bronchi, into which the softened tubercles open, and along which the softened matter passes, in the course of its excretion. The bronchi and tissues surrounding the tubercles, irritated by the morbid matter, furnish an increased and altered secretion, which, with the softened tubercular matter, constitute the sputum; and this varies in character with the extent and intensity of the inflammatory irritation induced by this matter in the adjoining tissues and in the bronchi. The cough depends upon, and is modified by, the amount and properties of the matters proceeding from these sources, and the degree of irritation thereby produced in the trachea and larynx. While these changes are proceeding in the earlier tubercular deposits and in the adjoining structures, the inflammatory irritation thus induced extends to the pleura, covering the portion of lung chiefly affected, and lymph is effused from it. The exuded lymph, coming in contact with the surface of the costal pleura opposite, gives rise to adhesions, which become cellular, and vary in firmness and extent with the duration and severity of the disease. These pleuritic adhesions are generally greatest over, or are confined to, the parts where the tubercular deposits are greatest; and, especially owing to the inflammatory action producing them, account in great measure for the pains experienced in the upper and lateral regions of the chest. The consequences of the softening and breaking down of the tubercles are the formation of *cavities* and various *changes* in the adjoining tissues and in the bronchial tubes. These cavities are first formed in the superior lobes, while the lower portions of the lungs are gradually becoming tubercular, the disease generally advancing downward.

33. *c.* The *cavities* may be formed by the dissolution of either solitary tubercles, or of conglomerated tubercles, or of tubercular infiltration. They are of all sizes, from the size of a pin's head to that of a large orange, or even larger. Their walls consist either of the lung-tissue infiltrated with tubercular matter, forming a more or less dense layer, and being in some cases of

such firmness as to prevent any dilatation or contraction of the cavity, or merely of a membrane or membrane-like sac, attached to the surrounding tissue of lung. In very old cavities the internal cavities often present a more or less dense, polished or smooth, and serous or sero-fibrous surface, while in others recently formed the surface varies in firmness or softness, presenting neither of the appearances just stated, in any marked form. Between these the changes of the surface are very diverse, according to the size and duration of the cavity. The cavities generally communicate with one or more of the bronchial tubes, and are rarely free from puriform mucus, or from pus, or an ichorous pus, or from blood. Owing to these differences in the size, in the walls and contents of the cavities, as well as in the surrounding structures, and to other circumstances, the physical signs which cavities present are very different and varied.

34. The extent to which the lungs have become tuberculous, as Sir J. CLARK justly remarks, varies, in this stage of phthisis, very remarkably in different cases, without a corresponding difference in the severity or duration of the symptoms. Two patients having symptoms exactly similar, may be the subjects of a very different extent of pulmonary disease. In some cases a few weeks may suffice to develop cavities of greater or less extent, while in others many months, or even years, may pass without any remarkable increase or diminution of the symptoms, or even of the pulmonary lesions. In a small proportion of cases a curative process is established, as will be noticed in the sequel (§ 145, *et seq.*), by which the tuberculous changes are arrested or partially obliterated; and if the patients' general health be maintained, the indications of tubercular deposit may gradually disappear, or at least advance no farther. But by trusting to symptoms alone, the state and progress of the tubercular lesions, without having due reference to physical signs, cannot be ascertained with any degree of precision. It must be evident, however, that a degree of importance beyond that which these signs possess should not be accorded to them, and that the fallacies to which they are liable should be duly estimated.

35. *d. Physical Signs.*—The upper parts of the chest are at this period less freely raised during inspiration than in the healthy state, and this is often more evident on one side than the other. —*a.* The *sound on percussion* is dull under one or both clavicles. SKODA remarks that when the cavity is formed within a portion of air-containing tissue, the percussion sound remains unchanged; and this is true not only of a small, but even of a tolerably large cavity. The only sound which cavities situated within a healthy structure yield is the cracked-pot sound, but this only in rare cases, where the cavity approaches the walls of the thorax, contains air, and is not smaller than a pleximeter. The sound in these cases is more tympanitic over the situation of the cavity than at other parts of the chest. Cavities containing air, even when deeply seated within a portion of lung infiltrated with tubercular matter, will emit a tympanitic sound if their size be not less than a walnut. Several smaller cavities, seated close together, will produce the same sound. The more flexible and movable the walls of the thorax, the more readily is the tympanitic sound emitted. The sound is clearer the nearer the cavity is seated to the surface of the lung, and fuller the larger the cavity. The cracked-pot is most readily heard when cavities are large and superficial. "A cavity will not yield a metallic ringing sound unless it be the size of a fist, but it does not necessarily emit such a sound, though it be of that size."

36. *e. On auscultation*, a dry or large-bubbling crepitant râle is heard over large cavities, when their walls are yielding, and dilate and contract during respiration, the lung being attached to the costal pleura. This râle is most readily heard when there are several or many cavities, of the size of a pea or bean, scattered through the lobe; it is never heard alone, but in combination with other râles or whistling or sonorous sounds, owing to the presence of muco-puriform or other morbid exudations in the affected portion of lung, or its vicinity. If these latter be very loud the crepitation may not be heard. SKODA observes that when a few deep-seated cavities are present in a lung which is otherwise healthy, the vesicular breathing, interrupted by a few bubbles of a muffled râle, may be heard over them; generally, however, the murmur in such cases is not vesicular, but indeterminate. "Cavities with membraneous walls, situated in the midst of air-containing tissue, even though of large size, never give rise to bronchophony, bronchial breathing, or consonating râles." These râles and whistling and sonorous sounds may take place in cavities, the walls of which have a thickness of at least several lines; and if their thickness be considerable, the breathing and the voice may be accompanied by metallic tinkling and amphoric resonance. When the walls are thick and unyielding, there is neither increase nor diminution of the size of the cavity during inspiration and expiration, the air neither entering into nor passing out of the cavity, and consequently no murmurs are emitted from the cavity; those which appear to proceed from it are *consonating murmurs.* But murmurs may be produced within the cavity, if its walls are flexible, and permit the entrance and exit of air during respiration, especially if adhesions of the pulmonary with the costal pleura exist over or near to the cavity. Râles and whistling sounds can be produced in a cavity only when the current of air is interrupted by the morbid secretion contained in it, or in the bronchial tubes communicating with it. The movement which this secretion undergoes during inspiration, and especially during coughing, is attended by râles, or by whistling sounds, when air as well as fluid is present in the cavity.

37. From the above, and owing to the varying sizes, to the situations, to the walls, to the contents, and to other circumstances, of cavities, it must be manifest that *percussion* and *auscultation* afford very few certain signs of the existence of cavities. In this opinion I am fortified by that of SKODA, the most experienced observer of physical signs in Europe. I may remark, however, that tubercular masses and tubercular infiltrations do not exist for any considerable time without producing cavities. Cavities may, therefore, be safely inferred to be present whenever the tubercular disease is of considerable standing, and when the constitutional symptoms mentioned above have existed for some time. SKODA justly remarks that "loud bronchial breathing, loud large-bubbling râles and bronchophony are often heard over cavities; but we as often, and often-

er indeed, meet with cavities which do not reveal themselves to us by auscultatory signs."

[DR. AUSTIN FLINT, in opposition to this opinion of SKODA, that "tubercular cavities do not reveal themselves to us by auscultatory signs," remarks as follows: "As regards cavernous respiration, observations directed more especially to the variations in pitch of respiratory sounds, have led me to the conclusion, in opposition to high authority, that the ingress and egress of air, from an excavation of an adequate size, under favourable circumstances, may be readily distinguished; that the cavernous and the bronchial respiration are not, as far as audible characters are concerned, identical; and that the normal laryngo-tracheal respiration is the type of the bronchial, but not of the cavernous respiration. The distinctive features of the cavernous respiration consist of an inspiratory sound, non-vesicular, or blowing, but, compared with the bronchial inspiration, low in pitch, hollow, more slowly evolved, and of an expiratory sound, if present, lower in pitch than the sound of inspiration. A fair number of observations, in which these features of the respiration were localized during life, and found to correspond in their situation with cavities ascertained to exist after death, have led me to entertain the belief that the existence and seat of excavations may be predicated on the auscultatory characters just mentioned, whenever they are distinctly manifested. But owing to the number of circumstances which must be combined, in order that a cavernous respiration may be developed, it will often happen that when cavities have formed, examinations fail to discover the evidence of their existence. Indeed, it is often only after repeated explorations, made at different times, and conducted with much care and patience, that they are detected."—(*The Principles and Practice of Physical Exploration, as applied to the Diagnosis of Diseases of the Respiratory Organs.* By AUSTIN FLINT, M.D. Philadelphia, 1856, 8vo, p. 500.)]

38. *C.* THIRD STAGE.—This period of the disease is merely the former gradually increased in severity—the second gradually lapsing into this. But during its progress various complications, and additional phenomena, present themselves, caused by the extent of lesions in the lungs, the increase of cavities, formation of additional ones, and more extensive tubercular deposits; by the contamination of the circulating fluids, and by disease of related or remote organs.—*a.* The thorax at this stage is generally flat instead of round or prominent; the clavicles appear remarkably prominent, owing to the depression of the ribs, to a hollow space existing between them and the upper ribs, and to the shoulders being raised and brought forward. The sub-clavicular regions are nearly devoid of motion during respiration; and during *a full* inspiration, the upper regions of the chest seem to be raised forcibly instead of expanding with the elasticity and ease of health.

39. The constitutional symptoms are still more severe than in the former stage. The pulse becomes quicker and weaker; the hectic symptoms more pronounced; the flush in the cheeks more marked and circumscribed, particularly in the evening; the emaciation and debility greater; the cough and expectoration more frequent, especially at night and during the morning; and the breathing shorter and more oppressed. During this stage, the patient is exhausted by copious perspirations and attacks of diarrhœa, the one sometimes alternating with the other. These assume a colliquative character, and their accession at the commencement of, and continuance during this stage, have led to the denomination of *colliquative stage*, which has usually been applied to it. In addition to these, the feet and ankles often become œdematous; the nails of the fingers, if not before, are now incurvated; the cough and restlessness during night increase; copious perspirations break out as soon as the patient falls asleep; pains in the chest, collar-bones, and shoulders, or in the sides, are much complained of. The sweats and colliquative diarrhœa rapidly increase the emaciation, the integuments covering the more prominent parts of the back becoming inflamed, sore, and liable to ulceration from the pressure to which they are subjected. Nevertheless, the patient's appetite is often not materially diminished, and hopes of recovery are generally entertained nearly unto the last. With the emaciation and exhaustion, the mind becomes enfeebled, although the imagination is often active. During the last few days or weeks of existence, the mouth, tongue, or throat, or all these, become aphthous; the features sunk, collapsed, and sharp; and, in some cases, mild delirium, very rarely violent delirium, followed by sinking or coma, closes the scene.

40. The severity and rapidity of the symptoms and progress of the malady vary remarkably in different cases. In some a progressive wasting, with little pain, without much cough, but with diarrhœa and perspiration, in the last stage, is chiefly observed, sanguine hopes of recovery being entertained. In others, and these the majority, the chills and sinkings following the perspirations during the nights and mornings; the exhaustion and distress produced by the diarrhœa; the harassing cough and difficulty of expectoration; the dyspnœa and sense of suffocation; the pains in the chest, and sometimes in the bowels; the mental struggle between hope and fear, especially in the latter part of this stage, mark not only the severity of the disease, but also the distress experienced by the patient. The termination of the malady is thus characterized by a state of tranquillity, ease, and gradual sinking, in some cases, and by a painful and distressing struggle in others.

41. *b. The physical signs* are generally the same as, or more fully pronounced than in the second stage. *Percussion* generally emits a dull sound over the superior parts of the chest, although the excavations which partially occupy the upper lobes, and the emaciated state of the parietes, may render the sound less dull than in the preceding stage. On *auscultation*, the respiration is obscure in places, or even inaudible, while in others it is particularly clear, bronchial, or tracheal, or the cavernous of LAENNEC. There is a mucous râle, produced by the morbid secretion in the bronchi, and a gurgling sound on coughing; pectoriloquy is frequently distinct, although as often absent, in one or both sides, or present at one time and not at another.

42. *Pectoriloquy*, or the resonance of the voice in a cavity existing in the chest, is one of the most uncertain signs in this and the second stage, for the reasons stated above (§ 35–37). Various indeterminate sounds are also heard in different parts of the chest, often with the signs of pleuritic, pulmonary, or bronchial inflammation.

43. ii. OF CERTAIN SYMPTOMS AND SIGNS DIAGNOSTIC OF PULMONARY PHTHISIS.—The diagnosis of pulmonary phthisis is usually easy in the second and third stages, but often difficult in the first, for in this the physical signs furnish no more certain aid than the constitutional symptoms. Various aids, however, to the diagnosis have been recently recommended.—*A. Observations of the time during which the breath may be retained after a full inspiration* have been recommended (the patient being sometimes desired to count as far as he can), in the first stage of phthisis, in order to assist the diagnosis, and are of some use when carefully made; but the results vary so much in different persons in health, and still more so in other diseases of the chest, which are not strictly consumptive, as emphysema, chronic bronchitis, chronic pleurisy, and pleuritic effusions, diseases of the heart, &c., that little dependence can be placed upon them, unless when viewed in connexion with the existing phenomena and with the absence or presence of the symptoms and signs of these diseases.

44. *B. Observations by the spirometer* are in some degree liable to the same objections as those just now stated. This instrument, invented by Dr. HUTCHINSON for ascertaining the capacity of the lungs for air in diseases, may, however, be used in incipient phthisis with some advantage, but it can be employed only in public institutions. The indications of the extent to which the lungs are obstructed by tubercular deposits, must necessarily have reference to the average capacity of the lungs, of persons of the same size, in health. Consequently, it was requisite to ascertain this latter point, in the first instance; and he found, after a very great number of observations of the capacity of the lungs for air in persons in health, that this capacity increased with the height of the individual in a very determinable proportion. To this part of the subject it is unnecessary farther to refer, than to state that the "vital capacity of the lungs for air" was inferred from the average of upward of a thousand persons in health, whose lungs were thus measured. *The following table shows the comparison of healthy lungs, and of lungs in the first stage of phthisis, or before softening, all cases being males:*

No. of Cases.	Age.	Height.	Vital Capacity.		Difference.
			Healthy.	Diseased.	
		ft. in.	cub. in.	cub. in.	cub. in.
1	28	5 8	238	186	52
2	28	5 4½	206	140	66
3	37	6 2½	286	270	16
4	20	5 3½	198	120	78
5	27	5 7	230	85	145
6	45	6 0½	270	200	70
7	36	5 6½	222	182	40
8	36	5 5½	214	170	44
9	35	5 7	230	160	70
10	38	5 10½	254	140	114
11	33	5 7	230	80	150
12	28	5 7½	230	180	50
13	27	6 1½	274	260	14
14	24	5 6½	222	190	32

45. Cases Nos. 5, 10, and 11, present a great deficiency. In these both sides of the lungs were much diseased, and in the two former emphysema also existed to a considerable extent. The foregoing table, as well as the following, are taken from "*The Medical Report of the Hospital for Consumption.*" The next table shows *the comparison of Healthy and Diseased cases in the second stage of Phthisis, or after softening, all being males:*

No. of Cases.	Age.	Height.	Vital Capacity.		Difference.
			Healthy.	Diseased.	
		ft. in.	cub. in.	cub. in.	cub. in.
1	27	5 6	214	86	128
2	21	5 5½	214	60	154
3	45	5 9½	246	85	161
4	30	5 6½	222	70	152
5	33	5 8½	238	70	168
6	26	5 6½	222	50	172
7	28	6 0	262	70	192
8	38	5 8	238	60	178
9	41	5 9½	246	90	156
10	42	5 8	238	60	178
11	29	5 5½	214	50	164
12	32	5 7	230	70	160
13	42	6 0	270	140	130
14	29	6 2	286	150	136

46. All the cases in the above table show a very marked deficiency of vital capacity. In Nos. 3, 7, and 8, and probably in others, both lungs were extensively diseased. In the following table "*the vital capacity of phthisical patients is exhibited, indiscriminately, without reference to the stage of the disease, compared with that of the same number of healthy individuals:*"

No. of Cases observed.	Mean Vital Capacity.		Difference.	Difference per Cent.
	In Health.	In Cases of Phthisis, all Stages.		
	cub. in.	cub. in.	cub. in.	cub. in.
415	222	129	93	42

47. *The following table shows the comparison of healthy individuals and of cases of phthisis in the first stage, or before softening:*

No. of Cases observed.	Mean Vital Capacity.		Difference.	Difference per Cent.
	In Health.	In Phthisis, 1st Stage.		
	cub. in.	cub. in.	cub. in.	cub. in.
241	223	149	74	33

48. *Table showing the comparison of healthy persons and cases of phthisis in the stage after softening.*

No. of Cases observed.	Mean healthy Capacity.	Mean diseased Vital Capacity.	Difference.	Difference per Cent.
	cub. in.	cub. in.	cub. in.	cub. in.
174	221	105	116	52

49. *C. Hæmoptysis* is often the first symptom which excites the alarm of the patient in phthisis, and the attention of his friends. The older writers often considered hæmoptysis a cause of phthisis, whereas modern research has shown that it is a sign of this disease, tubercular deposits being its cause. The following table, from the Report of the Hospital for Consumption, shows *the existence or non-existence of Hæmoptysis in* 1381 *cases of Phthisis, arranged according to the sexes, without reference to age: Males,* 910; *Females,* 471. *Total,* 1381.

	Males.	Per Cent.	Fem.	Per Cent.	Total.	Per Cent.
Hæmoptysis....	563	61.9	307	65.2	870	63
No hæmoptysis	347	38.1	164	34.8	511	37

50. The reporters remark that a large proportion of the above cases was seen at an early period of the disease, and that not a few of them were only a short time under observation. Hence many of those in whom this symptom had not occurred when the cases were noted would in all probability be sufferers from it during the farther progress of the malady. It may, therefore, be assumed that the proportion of cases in which hæmoptysis occurs is still greater than that shown in the table. It would result from the above that nearly an equal proportion of *males* and of *fe-*

males are found to present this symptom. The following table *shows the existence or non-existence of hæmoptysis in* 1084 *cases of phthisis; viz., males*, 706; *females*, 378—*arranged according to the sexes in decennial periods. Also the per-centage of the cases in which hæmoptysis occurred:*

Age.	Hæmoptysis occurred.		Hæmoptysis did not occur.		Total of Cases observed.		Hæmoptysis occurred per Cent.	
	M.	F.	M.	F.	M.	F.	M.	F.
0 to 5	0	3	2	4	2	7	...	42·9
5 to 15	7	39	14	9	21	41	33·3	78·0
15 to 25	124	107	85	45	209	152	59·3	70·4
25 to 35	175	59	71	42	246	101	71·1	58·4
35 to 45	115	35	48	25	163	60	70·6	58·3
45 to 55	29	7	23	8	52	15	55·8	46·7
55 to 65	3	0	10	2	13	2	23·1	
65 to 75	0	0	0	0	0	0	...	
Totals..	453	243	253	135	706	378	64·2	64·3

Dividing the age of 70 into two equal periods—into two 35 years—the per-centage of cases of phthisis in *males* was 64 in both periods; while in *females* it was 67 for the first 35 years of age, and 54·6 for the second 35 years. In females, also, from 5 to 25 years of age, hæmoptysis occurred in the ratio of 72 per cent.; while between the ages of 35 and 55 it appeared only in the ratio of 55 per cent. The reporters farther state that the *stage* of the disease in which hæmoptysis occurred was noticed in 696 cases, of whom 453 were *males*, and 243 *females*, as in the following table:

	Males.	Per Cent.	Females.	Per Cent.
Before softening	333	73·5	176	72·4
After softening.	120	26·5	67	27·6

This table shows that hæmoptysis is much more frequent (nearly as 3 to 1) in the first period of phthisis than in the second and third conjoined, and nearly equally so in both sexes. It is very difficult to account for this greatly increased frequency of hæmoptysis in the first stage of the disease; but it is probable that it appears greater in this stage than it actually is in practice, the whole progress of the disease having been observed; inasmuch as the reporters admit that many of the cases were only a short time under observation, and were not seen in the far-advanced progress of the malady. There can be no doubt, however, that the occurrence of hæmoptysis in so large a proportion of cases in the first stage establishes it as an important diagnostic symptom of phthisis.

51. *Hæmoptysis* is generally a symptom, but very rarely a cause, although it may determine the development, of tubercles in the lungs of a scrofulous person, or the debility induced by a very abundant hæmoptysis may have a similar effect; and, as M. ANDRAL has shown, the infiltration of a portion of the effused blood into the air-cells and pulmonary structure may form a nidus for the primary deposit of tubercles. Notwithstanding these exceptions, as far as they may be considered as such, hæmoptysis may be considered as generally produced by tubercles, although it may be conceded that, in some cases, especially when slight or moderate, it may be viewed as the result, in common with the tubercular deposit, of the sanguineous congestion of the lungs, often preceding and attending the early stage of phthisis, especially in the scrofulous and sanguineous diatheses. It should not be overlooked that the hæmoptysis may be produced by the pulmonary congestion consequent upon impaired vital action, or upon structural lesion of the heart, and by the severity of the cough, either independently of or in connexion with these conditions of the heart, the blood effused into the pulmonary tissue and air-cells proving the matrix of tubercles, as ANDRAL contends. When hæmoptysis proceeds from these morbid states it is usually copious, and is often less dangerous than the slighter states of it, more obviously dependent upon the early stages of phthisis. BAILLOU remarked that large discharges of blood from the lungs are less dangerous than small; and although this is very frequently but not absolutely the case, it by no means deserves the importance attached to it by PORTAL. M. LOUIS remarks, respecting this symptom in this and other diseases, that, with the exception of some cases in which it depended upon external injury, or was connected with suppressed catamenia, it indicates, with a high degree of probability, the presence of tubercles in the lungs; and Sir JAMES CLARK states that his experience supports this conclusion. According to LOUIS, hæmoptysis occurred more frequently in females than in males, in the proportion of three to two—a proportion much higher than stated by other observers; and he considers it most frequent in females from forty to sixty-five, that is, after the period of the cessation of the catamenia; but in this also he is not supported by other observers in different fields of observation. The frequency of the attacks, he remarks, was generally in proportion to the duration of the disease, the more copious discharges having rarely occurred oftener than twice or thrice in the same persons. "In all his cases it was present, in a greater or less degree, in two thirds; and the numbers in which it was copious and inconsiderable were nearly equal." In some it was a frequent symptom during the whole course of the disease, in others it never appeared. In persons advanced in life and in young children it rarely occurred, and then chiefly towards the close of the disease. In rare cases it was the first symptom, even before the cough, occurring suddenly, and, as M. LOUIS asserts, in the midst of perfect health, and without any appreciable cause. This latter assertion does not agree with my experience, nor with that of Sir J. CLARK, who very justly remarks that he has generally found the aspect of the patient to have been by no means indicative of perfect health, although he may not have complained; and that he has more frequently known the hæmorrhage to succeed bodily exertion, such as running, ascending heights, or long speaking, than when no such evident cause had occurred. In these cases the hæmoptysis often does not appear until a few hours after the exertion. I entirely concur in the opinion here expressed in opposition to M. LOUIS.

52. The quantity of blood expectorated varies remarkably from a teaspoonful or tablespoonful to one or even two pints; most frequently it is only about two or three mouthfuls. In some, the blood merely appears in clots or streaks in the sputum, in others it is distinct and in some quantity; when the latter, it is generally pure, sometimes frothy or florid; at others dark or slightly clotted. Very large quantities are brought up with varying remissions; but at an advanced stage of phthisis the hæmorrhage is usually continuous, until several pints are discharged, and the patient is sunk by it or suffocated. This copious hæmoptysis is generally owing to the ero-

sion of a considerable vessel by the tubercular ulceration. It is not very often that great hæmorrhage occurs at an early period; and yet I have known cases in which upward of 100 ounces were lost at the commencement of the disease. Hæmoptysis, therefore, taking place either before or after cough or shortness of breathing, should be viewed as indicating tubercles of the lungs, although it may arise from disease of the heart, associated with the same symptoms only in very rare instances.

53. *D. Cough* is generally the earliest symptom of phthisis, but is often so slight as not to excite the attention of the patient or his relatives; and for some considerable time it may occur only or chiefly in the morning. In such cases, and at this early period, the character of the cough, the state of breathing, and the appearance of the features, particularly of the eyes, ought to be examined, and the representation, often adduced, that it is merely a stomach-cough, or from laryngeal irritation, should not receive any attention; for it may be either or both of these, and not the less depend upon, or be connected with, tubercular deposits in the lungs. The continuance of the cough for weeks, or even months, without any expectoration, is of itself sufficient to cause strong suspicions of its origin. The association of the cough with shortness of breathing, any exertion causing cough or increasing the quickness of respiration, is an additional proof of the nature of the disorder. The cough is after a time observed in the course of the day, or upon suddenly changing the apartment or the temperature, or upon reading, exerting the voice, &c., and it is afterward followed by the expectoration of a transparent frothy fluid, which is often represented as coming from the pharynx and fauces. The cough generally increases with the progress of the pulmonary lesions, but such is not always the case; for, as will be stated hereafter, it may be very slight, or almost absent throughout the disease, or appear only a few days before death. Such instances have been remarked by PORTAL, LOUIS, ANDRAL, CLARK, and myself. In the course of the chronic and more protracted cases of phthisis, even when tubercular excavations undoubtedly exist, it is not unfrequently observed that, in favourable circumstances, cough and expectoration disappear for weeks, but return upon exposure, or from errors of regimen. In the advanced progress of the malady cough is generally severe, occurs at all times, often without any evident cause, but especially at night and in the morning, disturbing sleep, occasioning pain in the chest, or even sometimes causing vomiting. In the last stage it is often followed by breathlessness amounting to a sense of suffocation in some cases, or to sinking in others. The cough at the commencement of phthisis is entirely owing to sympathetic irritation of the larynx, and not to a fluid which requires to be expectorated. As the malady proceeds, it is chiefly caused by the discharge of the morbid secretions from the bronchi, or from both the bronchi and the cavities.

54. *a.* Tubercular or *phthisical cough* may, however, be confounded with the *cough of catarrh*, or of *influenza*, or of *gastric*, *hepatic*, or *nervous disorders*. Of the *first* it may be said that the attack is readily referred to its cause, is well marked and preceded by the usual symptoms of catarrh, either slight or acute. It is often attended by hoarseness, by soreness of the chest or trunk; and although at first dry and hoarse, it is soon followed and accompanied with expectoration, which is at first colourless, frothy, but afterward opaque or mucous, yellowish, or mucopuriform; both cough and expectoration generally diminishing with this change of the sputum, and shortly ceasing altogether. When, however, the catarrh assumes a chronic form, or becomes exasperated, and passes into bronchitis, the difficulty of diagnosis may be much greater. *Bronchitis*, acute or chronic, will readily be distinguished by the symptoms and signs described in the article BRONCHI—*Inflammation of*; and *chronic catarrh* will be readily recognized as such, although, in consequence of the state of the lungs before the catarrhal attack, it may pass into phthisis; the shortness of breathing, the increased severity of the cough in the morning, the chills in the early part of the day, the age of the patient, the appearance of the eyes, and the occurrence of hæmoptysis, evincing the transition into, or the pre-existence of, tubercular disease.

55. *b.* The cough of *influenza* cannot be readily confounded with the cough of phthisis, if the character of the constitutional symptoms of the former, especially the pains in the head, back, and limbs, the general malaise, and the prevailing epidemic be taken into account. Influenza, as well as measles, hooping-cough, and other epidemic diseases, when attacking persons whose lungs are prone to tubercular deposits, may determine or excite the phthisical malady, or may develop it into a very manifest, acute, and rapid form, if it had previously existed in a latent form, or in its first or least apparent stage.

56. *c. Gastric cough* is readily mistaken for the early stage of phthisis, but it is louder and harder than the latter, is more paroxysmal, and often manifestly excited by some of the more prominent symptoms of indigestion, as by flatulency, acidity in the stomach, acid or acrid eructations, by a loaded tongue which is red at the point and edges, and by various other dyspeptic phenomena, especially by disorders of the bowels and liver, and by a loaded or high-coloured state of the urine. Gastric irritation may, however, be associated with the first stage of phthisis, and, when this obtains, the diagnosis will be more difficult; but the former disorder will generally declare itself, and claim the chief attention, as the readiest and surest indication for aiding the latter affection. A *stomach-cough*, often of much severity in the morning, when a gray tenacious mucus is expectorated—the cough being severe in consequence of the difficulty of bringing up the tenacious phlegm—is not so readily mistaken for a phthisical cough, as it is generally observed in connexion with manifest signs of indigestion, and in persons of mature age or advanced in life, and of a gouty or rheumatic diathesis, or in those addicted to full living or to the enjoyments of the table.

57. *d. Hepatic cough*, owing to its dryness, or to the slight mucous expectoration attending it, may be mistaken for the first stage of phthisis. But due attention directed to the state of the hepatic functions and to the region of the liver; the pale, sallow, and sunken appearance of the countenance; the disorders referrible to the stomach and bowels, and various other sympathetic phenomena contingent upon biliary and hepatic affections, will sufficiently indicate the source of the cough, when due attention is directed to it.

58. *e. Nervous* and other *sympathetic forms of cough* are occasionally observed, especially in delicate persons; and, chiefly as occurring in these, both excite suspicions of phthisis, and require investigation. A *nervous cough* is apt to occur in females both after and before puberty, and especially as a sequela of hooping-cough or of measles, and often excites alarm, not merely as it simulates, but as it may actually complicate, the first stage of phthisis. This cough is generally paroxysmal, is severe, and in protracted attacks, being sharp, barking, or tracheal, and without, or with merely a slight watery, expectoration. In females it frequently presents a hysterical character, with indications of nervous irritability and of uterine disorder, as catamenial disturbance, leucorrhœa, pains in the loins and the lowest part of the spine or sacrum; it is often occasioned by masturbation, and not infrequently disguises, as well as complicates, the first stage of consumption. *Intestinal worms* may occasion a cough, especially in young persons, which, owing to the pallor, flaccidity of the tissues, and emaciation, as well as to the short, dry, and hacking form of the cough, may be mistaken for incipient phthisis. Attention to the abdominal functions, to the state of evacuations, and inquiries as to the symptoms of verminous disorder, will generally indicate the nature of this cough.

59. *f.* Although the *diagnosis* of phthisical cough from other forms of cough is important, yet the mere determination of this point ought not to lead us to overlook the fact that they may severally complicate phthisis, especially in its first stage, may mask this stage, and may, moreover, either excite and determine its existence, or develop it into active and manifest forms, when it had previously existed in a slow or latent state. Whether, however, these forms of cough occur independently, or as a complication of phthisis, their removal by judicious treatment is requisite, inasmuch as they are injurious to the constitution, even when existing independently, and are sources of aggravation to the pulmonary disease, when they are complicated with it.

60. *E. Shortness or Quickness of Respiration and Dyspnœa.*—Quickness of breathing is one of the earliest indications of phthisis, especially when occurring in connexion with a hacking or short cough (§ 53). It has generally a marked relation to the quickness of pulse, and the severity of the febrile symptoms; in the more latent and chronic states of the disease it is not experienced unless more or less physical exertion be used; but on ascending a height, or on other occasions of exertion, the breathing is not only quick, but is also attended by more or less dyspnœa and sense of oppression in the chest. As the malady advances, especially in its more febrile forms, and when cough and expectoration are considerable, respiration is very quick, the acceleration being much greater in proportion to that of the pulse than in health or at an early stage; and the sense of oppression and dyspnœa are also greater. These symptoms are evidently caused by the extent to which the lungs are rendered incapable of their functions—to which the capacity of the organ to receive and hold air is impaired by tubercular deposits, by condensation of portions of the pulmonary structure, and by sanguineous congestion of other parts; the occurrence of hæmoptysis, by removing the latter morbid states, often relieving the cough and the breathing for a time. The state of the heart's action, an impaired contraction of its parieties, distention of its cavities owing to impeded circulation through the lungs, may severally also increase the pulmonary congestion, and the oppression and quickness of respiration, and favour or even occasion an attack of hæmoptysis. In many cases, quick or difficult breathing is not experienced until after an attack of hæmoptysis. In these it may be inferred that the hæmorrhage either increases the weakness of the heart's action, and favours congestion of its cavities, or infiltrates the bronchi and air-cells, or structure of the lungs, so as to impair the capacity of the organ for the reception of air; an increased frequency of respiration being consequently required to make amends for the diminution of capacity. In all cases, therefore, the state of the respiration should receive attention, and the cause of its increased frequency or its difficulty ascertained, particularly as respects the existence of lesions within or without the lungs—in the bronchi, air-cells, and pulmonary tissue, or in the cavity of the pleura, or in the heart.

61. *F. Expectoration* is not usual until the cough and acceleration of breathing, with quickness of pulse, has continued for some time. It is at first scanty, transparent, ropy or tenacious, grayish or frothy; often resembling saliva. After an indefinite period, specks of an opaque matter are seen in the transparent frothy fluid. "These specks differ in appearance, being at one time white, at another yellow, or even approaching to green, and again very frequently of an ash colour; partly sinking in water in little masses." The grayish and ropy portion of the sputum partly float in it, in the form of striæ, suspending the minute tubercular masses. Before or about the time of the change of the sputum to this state, streaks, or specks, or even small clots of blood, are occasionally seen in the expectoration. As the malady proceeds, the sputum becomes more opaque, of a yellowish hue, and is coughed up with more ease and in more distinct masses. At a later period, the sputum is of an ash colour, and is brought up in distinct, rounded, flocculent-like masses, enveloped in the transparent ropy portion. If the patient be directed to expectorate in a glass vessel two thirds full of water, some of these masses will be seen to sink to the bottom; others, which are frothy, will float on the surface, and parts of these will be suspended at different depths, often retaining the minute, cheese-like, or flocculent, tubercular specks or masses, or allowing these to sink to the bottom, yet connected with the surface by the more fluid and ropy portion of the expectoration. This change of the sputum into ash-coloured, distinct masses, with more or less of a thin mucous fluid, occasionally occurs only a few days before death, but more generally it has continued for many weeks or even months before this event. In some instances it retains the yellowish, puriform appearance, and forms smooth, flat patches; and in rarer cases it is semi-transparent, tenacious, and gelatinous, and, as in bronchitis, is separated with great difficulty from any vessel containing it. "During the last days of life the expectoration is in a more dissolved state, and sometimes of a darker hue; about this period, also, and often long before, it has a very fetid odour; finally it diminishes gradually, and often disappears entirely some days previous to death."—Clark.

62. Such are the usual appearances of the ex-

pectoration; but the periods at which it commences, and at which the changes take place, differ in different cases. Its characters also vary, or differ much, as certain complications or intercurrent affections occur in the course of the malady, as catarrhal or bronchial attacks, inflammation of the lungs or pleura, &c. The transparent, tenacious, and frothy sputum, although generally accompanying tubercular deposits, is only a secretion from the bronchi, and may take place independently of these deposits. The yellowish-green sputum, often also observed, is frequently discharged in chronic catarrh, and towards the termination of bronchitis. These, although often abundant in, and forming the chief part of, the expectoration in tubercular phthisis, proceed from the bronchial membrane. The two characters, however, which may be considered peculiar to that attending phthisis, are the striated mass, with a mixture of whitish fragments in it, and the ash-coloured, globular masses, which are observed in the more advanced stage of the disease. I agree with Sir JAMES CLARK in considering these as very rarely unaccompanied with tubercular disease.

63. The quantity of the expectoration varies remarkably in different cases, and is by no means commensurate with the extent of pulmonary lesions. It may be very small, or almost altogether absent, although large excavations are found after death; the disease having advanced rapidly to this issue. Even in an early stage, and while it is still transparent, the quantity is often very great; the disease also in these cases assuming a febrile or rapid form. PORTAL, ANDRAL, CLARK, and the author, have met with rare cases in which the expectoration has been entirely wanting, and the cough very slight up to the very close of life, and yet small tuberculous vomicæ and most extensive tuberculous deposits in some cases, and large excavations in others, were found after death. The cases of this description, which occurred in my practice, had been mistaken before I saw them for low nervous or typhoid fevers, although the rapid pulse, the still more rapid breathing relatively to the quickness of the pulse, the appearance of the features, the night-sweats, the emaciation, and the appearances of the fingers and nails, might have shown the nature of the malady, independently of the physical signs. As to the sources of the expectorated matter, it must be evident that, before softening of the tubercles has occurred, and before they have communicated with the bronchi, the bronchial membrane has supplied it, in consequence of the irritation extended to this membrane from the morbid deposit, and of the congested state of the pulmonary vessels, of which the tubercular deposits and the expectoration are the common and combined results. The softened tubercles and the surfaces of the cavities consecutively formed also supply a part, often very small, of the sputa, more especially that part which is the most characteristic of the malady. In cases where the expectoration is either scanty or nearly wanting, the severity of the constitutional symptoms, the rapidity of their progress, and the indications of a contaminated state of the circulating fluids, render it extremely probable that the morbid secretion from the surface of the cavities as well as the liquefied tubercular matter, are absorbed, or imbibed by endosmosis, and carried into the blood, which it thus poisons, thereby heightening and accelerating the symptoms. From the above it may be inferred that the state of the expectoration should always be viewed in connexion with the other phenomena of the malady; that it affords little evidence of tubercles in their early or crude stage, but when the change takes place in the sputum, and the debris of tubercles are present in it, then a very satisfactory proof is thereby furnished of the existence of the disease in an advanced stage. Besides the appearances of the sputa already considered, there are two others which deserve a special notice, viz.: *hæmoptysis*, from its frequency and importance (§ 49, *et seq.*); and *calcareous concretions*, from the various considerations suggested by them.

64. *The expectoration of calcareous concretions* from the lungs occurs either months or years after the appearance of pulmonary symptoms—generally after years have elapsed—the patient either having recovered or partially recovered, and having experienced a relapse. The size of these concretions varies from that of a hemp-seed to that of a pea or small bean. This last size is the largest I have seen, and was expectorated by a lady in the last stage of the malady, which had been of many years' duration. A medical friend was sent up the Mediterranean in 1820 for change of climate in the first stage of phthisis. He recovered, but expectorated these concretions on several occasions long afterward. He is now alive and in good health. Another medical friend lately called upon me and stated himself to have been then, and long previously, in good health, with the exception of a loud whistling noise, during both inspiration and expiration, which could be heard in any part of the apartment in which he was. He told me that he was considered to have been consumptive many years before that time. I said that he would soon expectorate one of these concretions, and he did so in a few days. It was of the shape and size of a split pea. He is in good health. But these concretions are not met with in these circumstances alone, but also in others much more serious or altogether hopeless, as in the last stage of the more chronic and protracted cases. They are then especially brought up with a copious expectoration, sometimes without any blood, at others with streaks of blood, but rarely with a more copious hæmoptysis. In a case now under my care the patient, in the third stage of phthisis, has expectorated a number of these concretions. She has been consumptive for many years; and for several years before the disease had reached this stage had occasionally brought up, with little apparent ailment, one or more of these concretions. When they appear in a state of apparent health, they are unattended by much or even any sputa beyond a little mucus, or mucus streaked with a little blood or bloody specks. The pathological conditions in which they are usually found will be noticed hereafter (§ 146).

65. *G. Pain*, especially acute pain, rarely attends the early stage of phthisis; but a slight or aching pain is often felt, although not often mentioned by the patient, in the shoulders, or near the clavicles or upper regions of the chest. In the second and third stages, pain, often of a severer character, is frequently experienced, and is generally referred to either side, or to the situation where the tubercular lesions are most advanced or extensive, and where the pleura has become implicated. When adhesions are formed between the opposite surfaces of the pleura, pains often severe are experienced, not only in one or

both sides, but also in the back or under the shoulder-blades. They are different from those of catarrh, bronchitis, and influenza, which are experienced chiefly under the sternum when coughing, and are characterized by a sense of soreness rather than by acuteness or sharpness. In some cases pain has been felt under the short ribs, and, owing to the lowness of the situation, has not always been referred to its true source. But it will generally be found to proceed from adhesions of the pulmonary, to the diaphragmatic or costal pleura. When the bowels are disordered, it may be caused by the state of the colon; but in this case the pain is not persistent, and often shifts its situation.

66. *H. The pulse* often furnishes important indications of phthisis, even before any of the phenomena already noticed can be detected. In persons about or after puberty, who are of a scrofulous diathesis, a frequent pulse, or a pulse above 80, should be viewed with suspicion, more especially if it be associated with a dilated pupil, a clear, or blue, or pearly conjunctiva, and shortness of breathing. In many chronic cases, the pulse may not be accelerated, even throughout the disease, or until its close, and may be considerably under 70 in the minute, especially in phlegmatic and bilious temperaments. A slow or natural pulse, the breathing being not much accelerated, is observed only in the more protracted cases, and when there are indications of amendment. Great quickness, smallness, or softness of pulse occurs chiefly in the more febrile or rapid cases, and in these the chances of amendment are very few.

67. *I. Hectic fever* approaches generally slowly and insidiously in phthisis, often appears in its slightest form early in the disease, and becomes more marked as the second and third stages are reached. In some cases, however, hectic is wanting, or is so slight as not to excite notice until it breaks out suddenly and severely with all the symptoms of an advanced and acute state of the malady. It is unnecessary for me to add at this place to what I have advanced upon this topic, when describing the successive stages of phthisis, and when treating especially of the several states and causes of *hectic fever*. To that article I therefore beg to refer the reader. See Fever, Hectic (§ 292, *et seq.*).

68. *K. The digestive functions* are generally more or less impaired at the commencement of phthisis, and even before pulmonary symptoms have appeared, assimilation and nutrition being also imperfect. The bowels are often not materially disordered at an early stage. They are, however, frequently more or less slow or confined, but very readily become free, or even profuse, after recourse to aperients. As the malady advances, especially as the pulse becomes frequent and hectic fever developed, the bowels are irregular in action, are sometimes costive, and afterward spontaneously and very freely relaxed, or even purged. In more chronic cases, the bowels often continue regular, and the stools are well coloured with bile, for a long time; but when the disease is far advanced, and especially towards its close, *diarrhœa* generally supervenes, and rapidly emaciates and exhausts the patient. In most cases, even early in phthisis, an active purgative, given to remove costiveness, not infrequently acts excessively; and a gentle aperient, at an advanced period, often produces the same effect, and occasions a diarrhœa which it may not be easy to arrest. It is chiefly in the second and third stages that diarrhœa becomes severe or obstinate. M. Louis found it in one eighth of his cases from the beginning unto death; in the majority during the latter stages; in some during the last days of life only; and in four out of 112 cases it did not occur. It is often a most distressing symptom, is preceded and accompanied by severe pains, followed by great sinking and exhaustion, and is followed by rapid emaciation. The evacuations are at first yellow and bilious; but they often become watery, curdly, offensive, or emit a sour odour; the diarrhœa depending, as I have shown at another place, upon the state of the follicular glands and mucous surface of the bowels, produced by the morbid condition of the blood, and by the elimination of morbid or effete matters from the circulation, by the intestinal follicles, disease of these follicles and ulceration ultimately taking place (see *article* Fever, Hectic, § 306). Diarrhœa often diminishes the cough and expectoration, but it seldom abates the morning perspirations.

69. *L. Emaciation* is generally present unless the patient is carried off, before it has advanced far, by some complication or intercurrent affection. Frequently more or less wasting may be observed early in phthisis, and in some it is the first symptom which attracts attention, especially when the disease is occasioned by vitally depressing and exhausting causes. In other cases the malady is advanced far before emaciation is considerable. This symptom is often associated with some degree of pallor and indications of deficiency of red globules, or of a thin or poor state of the blood; and this is the more remarkable, as well as the rapidity of emaciation, as the febrile symptoms and the diarrhœa increase. The state of the blood, even early in the disease, and the arrest of assimilation and nutrition, the consequent waste of red globules, and the impaired or deficient development of others, readily account for the emaciation, and the state of the circulation, as regards both vascular action and the vascular contents. Emaciation is an early symptom in many obscure cases, especially in persons above thirty or thirty-five years; it is not so generally observed at a very early period in young persons, especially in females, who are still regular or nearly so in their menstrual discharges. When it occurs without any manifest cause, and especially when it is attended by quickness of pulse, by morning chills, or by a sense of cold in the course of the spine, or by a short hacking cough, or by shortness or oppression of breathing, tuberculous disease of the lungs may be inferred; and if all these symptoms be present, the fuss, parade, manipulation, and charlatanry of a physical examination of the bare chest, so often unnecessarily and even injuriously practised, may in most cases be dispensed with.

70. *M. The fingers and nails* often early, but frequently also not until an advanced period, betray the existence of phthisis. The nails become uncated or bent inward upon the extremities or tips of the fingers, which are wasted; the last joints appearing enlarged or rounded, and clubbed or terminating in a coniform shape. This appearance is most remarkable when emaciation exists, and, with the symptoms just mentioned, or even alone, is a most unerring sign of tubercular phthisis.

71. *N. Œdema* of the extremities, especially of the lower, is observed chiefly or only during the last stage of phthisis. It may, however, appear earlier in delicate females, and when the catamenia are suppressed. It is sometimes so remarkable as to amount to anasarca, and, when this occurs, tubercular deposits in the structure of the kidneys, or albuminous changes in the urine, may be suspected.

72. *O. Morning perspirations* are among the most distressing symptoms of phthisis. The disease may be far advanced, and hectic symptoms long present, before the perspirations become copious or are complained of. When they appear, the second, if not the third stage of the malady, may be considered present; and they are then excessive, in relation to the chills and febrile reaction which precede them. This symptom is rarely absent, but it sometimes does not appear until nearly the close of life. Louis states that he has found it wanting in one tenth of his cases. When it has been wanting, I have observed the surface of the skin remarkably harsh or rough, abounding in epithelial scales, and foul or sordid. In these cases perspiration breaks out about the face and neck. It usually occurs about the same period of the disease as the diarrhœa, and depends upon the state of the blood occasioning that affection. It has been said to be vicarious of the diarrhœa, one being diminished when the other is increased; but this is not commonly the case, or in a slight degree only. The perspirations take place chiefly in the early hours of morning; if at all present early in the disease, they are only slight, or are confined to the head, neck, and chest; but when abundant, or at a far-advanced period, they break out generally over the body, and whenever the patient falls asleep. Occasional intermissions or remissions of them are observed. When they are abundant, a rapid termination of the disease may be inferred. The state of the perspiration is diagnostic of the stage rather than of the existence of phthisis; for when this symptom is manifest there can be no question of its nature.

73. *P. Aphthæ* are common in the last days of phthisical existence, during a week or two before death. They are sometimes slight, and in others severe. They may extend over the mouth, fauces, and pharynx, rendering deglutition difficult, painful, or even nearly impossible. When severe, the patient rarely lives many days; and yet, in two cases of chronic or protracted phthisis under my care, the patients rallied, and lived two years in the one case, and three in the other, after aphthæ were present for a considerable time in a severe form.

74. *Q. The hair* falls out in the advanced stages of the febrile or acute cases, and becomes more and more thin, and, in the mornings, wet with perspiration. But in the chronic and protracted states of the disease, it generally continues abundant, or in its usual state, nearly to the last, or until a short period before death. It often falls out very early when the malady has been caused by masturbation or premature or excessive sexual excitement.

75. There are various other contingent phenomena which sometimes supervene in the course of phthisis. Some of these either accompany certain forms of this disease, or result from complications which will be noticed in the sequel. Irritability of temper, nervous susceptibility, tremors, sinkings, &c., are often observed in the course of the malady, are consequences of the exhaustion of organic nervous power, and the consequent impairment of assimilation and nutrition, and the waste of the tissues and blood-globules. Nevertheless, the appetite of the patient, although fastidious and various, is generally not remarkably impaired. In the more chronic cases it is often natural, or but little diminished, until the last days of life. The mental powers are not materially affected. The reasoning faculties and the imagination are even unusually acute. In some cases, of the febrile form especially, slight or mild delirium occurs towards the close, but it is seldom violent unless the membranes of the brain become the seat of increased vascular action, with or without tubercular deposits, or the treatment is injudicious.

76. iii. Of certain Forms or Modifications of Phthisis.—The *more usual form* of phthisis having been described, with due reference to its stages and prominent symptoms, and to those physical signs which indicate the commencement and progress of the malady, in as far as they are entitled to confidence, or deserve to be made the basis of diagnosis, I proceed to notice briefly the more marked forms which the disease may assume under the influence of constitution, diathesis, predisposition, and causes. On this part of my subject much may be advanced, both as topics of speculation, and as matters of important practical interest; much, also, may be remarked requiring farther elucidation and more accurate investigation. Where the data are not positive, doubts may lead to more patient research, and to more positive knowledge.

77. *A.* The Latent Form of Phthisis.—This form is always insidious in its accession and progress. The patient is debilitated, indolent, mentally and physically depressed, and often complains of general malaise. The health is impaired, and lowness of spirits experienced. Emaciation is slight, and advances slowly. This state may continue some months or even years, and may be viewed as owing to nervous debility, or as approaching to hypochondriasis. The digestive, assimilating, and nutritive powers are more or less manifestly impaired; the surface is pallid and cool; the conjunctiva of a pearly hue, and the pupils usually dilated. The pulse is at first slightly or not at all accelerated, or quick or small; but becomes rapid on slight excitement, when also the breathing is short. Slight chills are afterward felt, or a sense of cold in the course of the spine, followed by heat of the palms of the hands or soles of the feet, and an increase of pulse. A short or slight hack or dry cough is observed, especially in the morning, or after exertion, when the breathing becomes short or oppressed. These symptoms are commonly but little attended to by the patient, although they often excite the anxiety of those about him. Aching pains are also sometimes experienced about the clavicles and upper regions of the thorax, but these, also, often fail to excite attention, or are viewed as rheumatic. Upon examination, a slight dulness on percussion, a feebleness of respiration, and a slight tracheal character of the vesicular murmur, or a louder or longer expiratory sound, are the chief physical signs.

78. Latent phthisis may occur in all temperaments, especially in the lymphatic, nervous, and bilious, and at all ages, and not infrequently in

the aged. In younger persons these symptoms sometimes disappear after change of climate and judicious treatment, or they increase and are followed by the grayish expectoration attending the first stage (§ 18); but generally, after many months, or even some years, the disease passes into one of the more declared forms about to be noticed; or the patient, having either partially or altogether recovered, expectorates the calcareous concretions noticed above (§ 64), often with little cough and scanty sputa; the expectoration of these sometimes occurring at intervals, or ceasing permanently, recovery being complete. Most frequently, however, after exposure, or after difficult, scanty, or suppressed catamenia, or after a severe catarrh, bronchitis, or limited pneumonia, or after influenza, measles, fevers, hooping-cough, &c., and even without any manifest cause of exacerbation, the disease passes into a chronic or a protracted, but open and manifest phthisis, or into a consecutively acute form, with the usual expectoration, perspiration, diarrhœa, emaciation, &c., and with the physical signs attending the far-advanced states of the malady. Hæmoptysis is not frequent in this form unless in its latter stages. The disease may continue latent in females, often masked by other ailments, as hysteria, chlorosis, uterine disorders, dyspepsia, bronchitis, or by pregnancy, until, upon the disappearance of the catamenia, or after parturition, or suckling, it breaks out into an open and acute form, and terminates rapidly, generally with fever, and sometimes with delirium.

79. This form of phthisis sometimes follows depressing or exhausting *causes*, or prolonged or neglected dyspepsia and impaired assimilation and nutrition, or catarrhal or bronchial affections, or hysteria, or pneumonia, or pleurisy, or affections of the throat, or partial anæmia; and these or other contingent or intercurrent disorders may mask its early course, in both sexes and at all ages, until it assumes one or other of the manifest forms about to be noticed. It is frequently connected in its origin and progress with a poor state of the blood, or deficiency of the red globules; this state of the blood, in connexion with impaired organic nervous power, either occasioning or developing the tubercular deposits.

80. The *lesions* most commonly seen in the lungs in this form are cicatrices in the upper lobes, with or without calcareous formations in or near their centres; crude and softened tubercles; both old and recent cavities, the former being somewhat contracted and having their surfaces smooth, or presenting a fibro-serous appearance, and adhesions both old and recent between the opposite surfaces of the pleura in one or several places.

81. *B.* Primary acute or rapid Phthisis.—This form occurs in persons apparently in good health, breaks out suddenly, and runs its course rapidly—in from five or six weeks to three months—owing either to the extent and severity of the morbid action, or to the feeble powers and defective vital resistance of the patient's constitution. This state of the disease occurs chiefly in young persons, and is often developed by measles, fever, scarlet fever, influenza, catarrh, bronchitis, pneumonia, or hooping-cough; and, although symptoms of tubercular disease were not evident before it supervened upon these maladies, or otherwise rapidly broke out, it may be inferred that it had previously existed for some time in a latent state, and that, when it had reached a certain extent, the symptoms and signs of its presence became rapidly manifest. In some cases severe physical exertion, fast running, loud speaking, has determined an attack, with more or less hæmoptysis and all the more violent and unfavourable symptoms of the malady. In these cases, the diseases just mentioned and other efficient causes have called the latent tubercular deposits into activity, not merely developing and accelerating their progressive changes, but also exciting morbid actions in the structures surrounding or adjoining them. That this view is correct is shown by the occurrence of this form chiefly in the scrofulous, lymphatic, and inflammatory diatheses, and in members of a family in which others have been subjects either of external scrofula or of phthisis. That the diseases just mentioned, or attacks of pulmonary congestion, or other causes, should have so rapidly given rise to tubercular deposits as the history of this form may indicate, is not very probable. It is most likely that the tubercles, at an early and latent state of their formation, had existed previously to operation of these causes, and had been thereby developed into a rapid maturity.

82. This form of phthisis may be divided into *two varieties*; viz., that in which the more characteristic phenomena of phthisis are present in a remarkable and severe degree, and that in which these phenomena are nearly if not altogether absent, the disease being often mistaken for low nervous or typhoid fever.—*a.* In the *former* of these the patient is attacked by chills, quickness of pulse, oppressed and rapid breathing, an aching pain and anxiety in the chest and præcordia, the pain or aching extending to the spine and shoulder-blades; a short cough, which is afterward constant and severe, with a scanty and frothy expectoration at first, which soon becomes copious and yellowish; and acute hectic fever, the pulse being very rapid and soft, the remissions slight, and the perspirations excessive and almost continued. The sputum now is generally similar to that ushering in the second stage of the more common form (§ 31). The countenance is anxious, pale, covered with perspiration, the conjunctivæ clear, and the pupils dilated; the surface of the skin has a pallid or dirty hue, the tongue is dark or loaded, and the prolabia somewhat livid; the cough, oppression, and dispnœa are so distressing as often to prevent the patient from lying down, and the breathing is short, shallow, and rapid. Hæmoptysis to a moderate extent sometimes occurs, but rarely produces relief. Vomiting takes place in rare cases. Diarrhœa occasionally appears towards the close, but is seldom severe, yet emaciation is considerable. At last the pulse can hardly be counted, and the dyspnœa is most distressing, and the cough almost suffocating. Slight delirium supervenes, the fingers and lips become livid, the nails dark and uncated, and death ensues, from four to seven or eight weeks from the attack, preceded for a few hours either by coma or indications of impending asphyxia. On percussion a dull sound is heard over nearly all the chest. Respiration is very weak in some places, and bronchial in others, and a mucous râle is generally present. No crepitation is heard, nor is the sputum characteristic of pneumonia. It is usually yellowish, is sometimes streaked with blood, or contains small clots of blood.

83. This form of the disease generally occurs

in young persons. I have seen it most frequently in females, especially after measles, influenza, and hooping-cough, and the suppression of the catamenia. In these the attack has often been produced by exposure to cold; and in some cases to which I have been called the disease has been considered either as bronchitis, or as pneumonia of both lungs, both which it nearly resembles. Indeed, it may be said to be very nearly allied to congestive bronchitis on the one hand, and congestive or nervous pneumonia on the other; but the previous history of the case, the scrofulous diathesis, the effects of treatment, the remarkable rapidity of breathing, the character of the sputa and of the physical signs, indicate the difference, as well as the alliance, between these diseases, and the appearances after death fully confirm this relation (§ 132). In 1853, a case of this kind occurred in a near relative; and in 1854 I was called to a recently married couple, both under twenty-five years, both of the scrofulous diathesis, and viewed by the father of one of them, himself a physician, as possessing a strong tendency to phthisis. Both were attacked with measles a few weeks after their marriage, and on recovery they went to the sea-side. They resided there for a short time, and, on returning to town, were exposed to cold. The lady had had the catamenia in excess; but she had passed the usual period two or three weeks, without indications of pregnancy. Soon after her exposure she was suddenly seized by chills, oppressed breathing, cough, and the other symptoms just mentioned. The attack was viewed as congestion of both lungs. External derivatives, a moderate cupping over the sternum, followed by dry-cupping in this situation and between the shoulders, and the treatment described hereafter, were prescribed. The disease proceeded as above, and terminated fatally in about five weeks. Her husband was seized in nearly a similar manner, but not so severely, very soon after her death. During her illness he appeared pallid, depressed mentally and physically, and slightly anæmied; his pulse was very rapid and weak. He had soon afterward a very slight, short cough in the morning, no expectoration, but hurried breathing on slight exertion. He did not wish to be considered ill, and refused medicine. Immediately after his wife's funeral, and more than usual exposure, he was seized with the acute symptoms mentioned above, and in a few weeks these terminated fatally, with slight delirium and coma.

84. *b. The lesions* in this form of phthisis have been considered by ANDRAL as those of a form of pneumonia, attacking the scrofulous diathesis, the gray tubercular granulations found after death being regarded by him as the results of inflammation of the air-cells. But the crude and more advanced tubercles formed in addition to these granulations, the quantity of tubercular matter infiltrating and consolidating portions of the lungs, the more general extension of these lesions throughout the lungs or to the lower lobes, the indications of vascular congestion of the pulmonary structures, and even of the bronchi, and the presence of some degree of œdema or serous infiltration of these structures; and still more the occasional existence of small recent cavities, partially evacuated of their contents, and without lining membranes, are evidences that the tubercular deposits, from their extent, and the sudden production of congestion of the pulmonic and bronchial tissues, had developed, more or less rapidly, a state of vascular action in these tissues, of an asthenic character, that had reacted on the tubercular deposits, and had accelerated their development; the severity and rapid fatality of the disease being occasioned by the great extent of these deposits, and by the associated changes in the lungs.

[The diagnosis of this form of *acute* phthisis is somewhat difficult, the physical signs being less distinctive than in ordinary tuberculosis. A marked disparity in the percussion-resonance is not always apparent, owing to both lungs being simultaneously, and in some cases about equally affected. This affection is characterized by an abundant and extensive deposit of gray, semi-transparent granulations, often in the form of infiltration, which undergoes a rapid process of softening, leaving corresponding excavations, if the patient survives a sufficient length of time. Notable dulness on percussion may not be manifest, if the granulations remain isolated. Auscultation may not furnish morbid phenomena other than are afforded in acute bronchitis, viz., the vibrating and bubbling sounds, including the sub-crepitant râle. The vocal signs of tuberculous solidification, viz., exaggerated resonance, broncophony and fremitus, are wanting. The prominent symptoms are chills, followed by febrile movement, rapid pulse, heat and dryness of skin, great debility, hurried respiration, dispnœa, lividity of the prolabia, cough, more or less violent, dry, or accompanied by little expectoration, which is sometimes bloody, &c. Emaciation is generally much less strongly marked than in ordinary tuberculosis. Reasoning by exclusion, we shall, with due care, be able to distinguish this form of disease from cardiac affections, pneumonitis, bronchitis, or typhoid fever, with which it has sometimes been confounded.]

85. *c. The second variety* of acute phthisis closely simulates either nervous, remittent, or typhoid fever, according to the modifications it presents in individual cases, while the *first variety* closely resembles congestive or nervous pneumonia (*see* LUNGS, INFLAMMATIONS OF, § 62, *et seq.*), in some respects, and asthenic bronchitis of both lungs in others (*see* BRONCHI, &c., § 37, *et seq.*).—This variety of acute phthisis is rarer than the preceding, and has not been noticed by those who have adopted diseases of the lungs for their speciality, the examination of the bared chest for the grand *coup* of fussy diagnosis, and the stethoscope as the baton of transcendental medical knowledge, if not of actual inspiration. This neglect is most extraordinary on the part of those who usually consider every case which comes under their view as pertaining to that region of medical science which they suppose themselves to be alone capable of cultivating. As in the preceding variety, so in this, the patient has appeared in good health, and if he have not felt this to have been the case he has not admitted it; nor have his friends detected it until he is seized by an outbreak of disorders which obliges him to keep to his bed and have recourse to medical aid. If this aid be of a proper kind, it will be found and admitted, at least in some cases, that a degree of ailment had been experienced for a considerable time before the accession of acute disease; that depression of spirits, indolence or indisposition to mental and physical exertion, debility, loss of appetite or indigestion, acceleration of breathing when ascending a

height, weakness in the joints, occasional chilliness, followed by heat in the palms of the hands or soles of the feet, especially at night, some degree of restlessness in the early part of the night, loss of colour or complexion, in some cases loss of flesh, an unusual brightness of the eyes, &c., had been present for some time, but that each or all of these were so slight as not to excite the anxiety of the patient, or they were not so manifest as to rouse the fears of his friends. The patient now feels a general prostration, has a quick pulse, with the usual symptoms of a remittent form of fever, which in a few days assumes a more continued type, the symptoms being, however, somewhat severer on alternate days. The bowels become irregular, at first confined, and afterward inordinately relaxed; the perspirations are usually abundant; the tongue is foul or loaded; the urine rather scanty and high-coloured, with copious deposits; the position in bed is on the back, with the head and shoulders more or less raised, or partially turned to either side; the features are somewhat sunk, the face pallid, and the general surface dusky, with a clammy perspiration, which is abundant over the head, face, neck, and chest; and aching or dull pains are occasionally felt about the clavicles, in the back, and under the scapulæ. During the course of these symptoms little or no cough is observed; if it be present it is commonly slight, dry, and insufficient to attract attention; but the breathing is remarkably quick, somewhat oppressed, and shallow. There is little or no expectoration, the sputum and other local symptoms being insufficient to direct attention to the state of the lungs, or to excite suspicions of the existence of rapid febrile phthisis, both cough and expectoration being apparently absent. The pulse is more and more rapid, slight or wandering delirium occurs, especially when the patient dozes or falls into a waking sleep; the hair becomes thin; the surface more dusky; the emaciation very rapid and extreme; and bed sores readily form on the more prominent parts. Death soon ensues, generally in four or five weeks from the commencement of the acute attack, either from the exhaustion consequent on diarrhœa, or from coma, or sinking following delirium.

86. *d. Lesions.*—I have seen four cases of this variety of febrile consumption, to which I was called in consultation at an advanced period of their course; and at that time the symptoms and signs of phthisis, in its third stage, were more or less manifest, upon a careful and minute examination, and with due reference to the history of the case and to the health of other members of the family. In three of these an *inspection after death* was allowed, and in all several cavities were found in both lungs mostly altogether empty and nearly dry. The blood in the lungs was of a dark colour, and only partially coagulated; few or no adhesions were found between the opposite surfaces of the pleura; and the lower lobes were as much diseased as the upper. The intestinal follicular glands, both solitary and aggregated, were more or less enlarged and ulcerated. Three of these cases occurred in females. The youngest was 18 years of age, the oldest of all was 27 years. It may be inferred that the cavities, which were small, mostly empty, and the smallest only, in two or three instances, full of these usual tubercular and fluid matters, had not communicated with the bronchi, or that the bronchi in connexion with them had been rendered impervious in the parietes of the cavities, from the condensation of the surrounding tissues, and that the morbid matters in these cavities had become absorbed, had contaminated the blood, and occasioned acute febrile symptoms of a typhoid or adynamic character. The circumstance of the softened tubercular matters in the cavities, and the morbid fluids flowing into them from their ulcerating parietes, not having passed into the bronchi, accounts for the absence not only of expectoration, but also of cough; while the emptiness of the excavations shows that their contents must have been absorbed, and being carried into the blood, explains the acuteness, the rapidity, and the typhoid character of the attendant fever.

87. *C.* CONSECUTIVELY ACUTE PHTHISIS is different from the two preceding varieties, chiefly as regards the character and duration of the symptoms preceding the exacerbation of the disease, and the development of the more acute and dangerous form. In these varieties the patient seems in tolerable health to those about him, and believes himself to be so, until the acute symptoms make their appearance, although the experienced observer cannot fail to remark indications of the approaching evil.—*a.* But the variety now about to be noticed is preceded by a slower and more manifest disorder of the respiratory functions than that preceding these varieties, and is in every way similar to the *latent* form of the malady, described above (§ 77, *et seq.*), although by no means latent to any attentive observer. After pallor of the countenance, or slight indications of anæmia, with or without emaciation, debility and inactivity, mental depression, languid or soft pulse, shortness of breathing, or short cough on exertion, and sometimes after the expectoration of calcareous concretions, have continued for a very considerable or even a long time, or for several months, or even years; and generally soon after exposure to cold, or after unusual exertion, the patient experiences chills or shiverings, or a sense of cold running down the back; or he is seized with hæmoptysis, and all the acute symptoms are fully evolved. Hectic fever, at first remittent, but afterward nearly continued; a rapid, weak pulse; very quick respiration; cough and copious expectoration; pains about the clavicles, scapulæ, or the sides, or the upper regions of the chest; colliquative perspirations, diarrhœa, rapid emaciation, aphthæ, sometimes with, but oftener without, slight delirium, ultimately supervene, and terminate life.

88. *b. The lesions* most frequently observed after death in this variety are, tubercles in various states of softening; small, or nearly cicatrized, or contracted cavities, with gritty, calcareous, or cheese-like matters in or near their centres; larger cavities, partially empty or containing blood, if hæmoptysis had preceded dissolution, and their parietes varying in appearance with their duration; condensation of the pulmonary tissue around the excavations, or congestion of portions of the lungs, and redness of the bronchial mucous membrane, &c.

89. *D.* PROTRACTED PHTHISIS may commence either in the usual form, or continue for years, first in a more or less latent, and afterward in a manifest state. It occurs chiefly in the phlegmatic and bilious temperaments. It is often characterized by slowness of the pulse, which seldom rises above 70, and often not above 65 in a min-

ute, by attacks of hæmoptysis, or more rarely by the expectoration of calcareous concretions; but, when the latter occurs, I have very seldom observed the former, unless in a very slight degree. It is sometimes simple or uncomplicated, but it is oftener associated in various periods of its course with one or other of the affections and lesions about to be mentioned. The nature of the disease is generally manifest; and the experienced observer will rarely fail to form a correct diagnosis, even without the aid of a physical examination, between it and bronchitis or chronic pneumonia, with either or both of which, however, it is often associated, at different periods, and even also with partial pleuritis. Percussion and auscultation are of use chiefly as showing the progressive changes and complications of the disease, although they are liable to the fallacies noticed above (§ 35–37), owing mainly to the states of the cavities, when they exist, and of the bronchi, arising from the presence or absence of the morbid matters that usually collect in them.

90. Several cases of very protracted phthisis have come under my notice, several of them in medical men. Dr. T. was attacked by hæmoptysis at the age of 20, when studying in Edinburgh. His circumstances having admitted of his relinquishing practice soon after entering upon it, and having experienced returns of the hæmorrhage with other pectoral symptoms, he travelled or voyaged to several parts in the West Indies, and in the south of Europe, generally passing a part of the year in one or other of these, and returning to England in the summer. Nevertheless, his phthisical symptoms never left him, were exacerbated after considerable intervals, and the hæmoptysis also returned, and was sometimes alarming. This state of health continued for many years, and he continued to pass his winters in some mild climate, most frequently in that which he found to agree the best with him. At about the age of 57 or 58 he first called upon me, told me his case, and informed me that he had consulted all the consumption doctors, and that they were almost equally divided as to the existence or non-existence of cavities. I told him, after a careful examination, that there were cavities in both lungs, but that they were small, and that they most probably were filled up by the accumulated morbid secretions for a considerable time, and thus they escaped detection. He continued under my care for several years, during the periods of his residence in London or its vicinity. But the attacks of hæmoptysis were more frequent, so much so ultimately that he always carried with him pills consisting of the ergot of rye, and a bottle of turpentine. He took the former as soon as the hæmorrhage appeared, and if that failed, he had recourse, as I had directed, to the turpentine. These means generally succeeded, but the other pulmonary symptoms gradually advanced. When about the age of 67, he was seized with hæmoptysis when getting out of a railway-carriage at Paddington, had recourse to his usual remedies, and sent for me.

91. Before I reached his residence he was dead, suffocated by the hæmorrhage. The body was inspected the following day. Several cavities were found in both lungs. None of them were large. The smaller were apparently contracted; their parietes were smooth, fibro-serous, and almost fibro-cartilaginous in parts; and one or two of them so much reduced as to be almost cicatrized; the parietes being quite smooth and fibro-cartilaginous. The surrounding tissue was condensed. Some of the cavities had membraneous parietes, while in others the walls consisted of a somewhat condensed pulmonic tissue, with minute openings, chiefly venous or bronchial. The cavities were all filled with blood, as were also the larger bronchi, and contained but little muco-puriform matter. This case had evidently been of forty-four years' duration; and it presented appearances, as respected the cavities, of the longest and shortest duration.*

92. *E.* PHTHISIS IN INFANTS AND CHILDREN occurs chiefly in the scrofulous diathesis, or as a consequence of protracted or neglected disorder of the digestive and assimilating functions, which in children may generate both the scrofulous diathesis and tubercular disease. Disorder of these functions may in all temperaments so affect the circulating fluids as to develop that habit of body, in early life, which constitutes the scrofulous diathesis, and which, in its more manifest states, implicates not merely the lungs, but other organs

* Dr. W. H., who had been editor of the "London Medical and Physical Journal" in the years 1819, 1820, and 1821, in 1823 evinced indications of pulmonary disease, and in the following year he had a most severe attack of hæmoptysis. He came under my care, and I advised him to pass the following winter at Naples. He returned to England in June, but was more or less of an invalid all the summer and autumn. He went to the coast of Devonshire the next winter; and he thus continued to change his place of residence for many years, often returning to London or its vicinity during portions of the summer and autumn. The pulmonary symptoms were sometimes slight, at other times severe. He died about 25 years after his first attack, in the vicinity of London. The treatment of this case, and of Dr. T.'s, was conformable with that which I shall have to recommend in the sequel.

Miss L. came under my care about nine years ago, in the third stage of phthisis. The symptoms and signs of cavities in the lungs had previously been recognised by the physicians whom she had previously consulted. When I saw her these were unmistakable. During the years which have intervened since my first visit, she has experienced intercurrent attacks of bronchitis, of partial pleuritis, &c., which have been successively overcome; and during the severe winter and spring of 1855 she was not confined a day to her apartment, and but rarely to the house. The physical signs and chief symptoms of cavities in the lungs still exist. I could adduce numerous other instances of the protracted form of this disease, if it were necessary to do so.

[We have known many cases of very protracted phthisis where the individuals lived to a good old age, and were capable of performing a considerable amount of labour during their long lives. Dr. W. was a well-known practitioner of New York, who died at the age of 68, and who in early life laboured under all the symptoms of pulmonary tuberculosis. After death extensive cicatrizations were discovered, showing the former existence of cavities. Dr. K., surgeon U. S. army, also laboured under tuberculosis for more than thirty years, during most of which time he was engaged in active service, and enjoyed a comfortable state of health. In both of the above cases hæmoptysis was a frequent occurrence.

Dr. C., of Utica, is another instance of the same kind, where all the physical signs of tuberculosis of the lungs, inducing cavities, have existed for more than 20 years, and yet he has been able to teach and practise his profession as extensively and successfully as almost any member of it. I could extend this list to more than twenty, which have come within my own observation; but a history of them would only go to confirm what is already well known, viz., the very protracted nature of this disease in particular exceptional cases.

More than 20 years since we attended a female who had laboured under amenorrhœa for more than six years. During the last year, she had a regular monthly attack of hæmoptysis, which lasted two or three days, the amount of blood expectorated being about the same as in an ordinary menstruation. She then married happily, has had several children, has never since experienced any symptoms of pulmonary disease, and is now (Jan., 1856) in the enjoyment of good health.—*Am. Ed.*]

also. When treating of *Scrofula* and *Tubercles*, I have shown that the scrofulous diathesis may either be inherited or generated by the parent, and by the offspring in childhood, by causes which depress or exhaust organic nervous power—impaired digestion and assimilation of the hæmatosine, and imperfect nutrition resulting therefrom—and thus engrafting scrofula and tuberculosis upon any temperament. It is therefore most important that this disorder of the digestive and assimilating functions in childhood should be recognised and traced to its causes, and that these causes should be removed.

93. The aspect of children thus affected suggests the idea of imperfect organic power. The child is languid or fretful; the flesh is flaccid; the skin harsh, dry, and unhealthy to the sight and touch. It is disinclined to play or to active exercise. The face is pale, pasty, or faded. The eyes appear large; the pupils are dilated, and the conjunctivæ white. The tongue is whitish, and dotted with small red points, the extremity and sides being red, and the root and centre loaded, or more or less furred, especially in the morning. The appetite is variable, often craving or unnatural; thirst is not infrequent, and the breath is fetid. The bowels are irregular, most frequently costive, but sometimes very loose; and the evacuations are offensive, often pale, grayish or clayey: occasionally mucus and imperfectly digested food are observed in the stools. The urine is either high-coloured at times, scanty or abundant, turbid or pale. The extremities are usually cold; and sleep is disturbed, and often followed by partial night-sweats. The child often talks when asleep, or grinds its teeth; and hence the complaint is often ascribed to intestinal worms, with which, however, it is not infrequently complicated.

94. If the complaint continue, the symptoms are not only increased, but others are superadded. The countenance is more faded and pasty; the upper lip is thick, tumid, or fissured; the throat and fauces red or sore, or the tonsils enlarged; the eyelids and tarsi are inflamed, or the pupils are dilated, the conjunctivæ pale or pearly; the nostrils are somewhat swollen or sore, or discharge a thick mucus; and mucus, mixed occasionally with blood, is passed from the bowels with frequent offensive and griping motions. These symptoms may continue for some time, the flabbiness and emaciation increasing, and becoming associated with quick respiration, cough, and mucous expectoration, occasionally streaked with a little blood. The skin is harsh and dry, but sweats break out during the night; languor and debility increase; the pulse and respiration are greatly accelerated; and the quickness of the latter relatively to the former increased. The pulmonic symptoms become, in most cases, more manifest, but vary much with the age and temperament, or habit of body, of the child. In the very young, they are often marked by disorder of the bowels, which frequently appears urgent, and is more or less connected with tubercular deposits in the mesenteric glands. In others, the great size of the head and the emaciated state of the limbs lead to the suspicion of incipient disease of the brain or its membranes, which indeed may be actually commencing, either as softening of the central parts of the organ, or as tubercular formations in the membranes; but these changes, as well as those in the mesenteric glands, may be contemporaneous with tubercular deposits in the lungs also, the amount of disease in this organ either predominating or advancing *pari passu* with that in the others. In many, especially the very young, the pulmonary tubercles never reach the stage of dissolution and tubercular vomicæ, the disease of the brain, or of the mesenteric glands and bowels, or the extent of tubercular infiltration of the lungs, even of the lower as well as of the upper lobes, terminating life before this stage is approached or advanced, although the emaciation, and the oppression and acceleration of breathing, are extreme.

95. In these cases the cough and expectoration may be slight; but the dulness on *percussion*, and impaired motion of the ribs, are generally remarkable. The other *physical signs* are nearly the same as stated above in respect of the early stage of phthisis (§ 24, *et seq.*); but those of percussion are more to be depended on than of auscultation, especially in young children; and, in those particularly, hæmoptysis rarely occurs, unless at an early period, and then as merely streaking the expectoration; but slight epistaxis is sometimes observed. The younger, also, the child, the more general are the tubercular deposits in the several organs, especially in the lungs, in the bronchial glands, in the mesenteric glands, membranes of the brain, &c.

96. *F.* THE DARK RACES are much more exempt from phthisis than the white; but very much depends upon race, and upon continued residence in the same or similar climate, on the one hand, and migration to a colder climate, on the other.* Of the degree of prevalence of this malady in different races, some notice, although insufficient, will be taken in the sequel; and I can here only mention the much greater prevalence of this malady in these races, especially the negro race, when they migrate to a temperate, or a cold or changeable climate. As to the usual course of the disease, when it attacks individuals of either a black, brown, or copper-coloured race, I am not enabled to speak with confidence; but, from what I have seen, it commences silently and insidiously, and advances more and more openly and rapidly to its fatal issue. In some cases the attack appears as a vital blight, by which the lungs are especially affected; a lower range of temperature or greater exposure than heretofore experienced, or other depressing or exhausting causes, while they impair organic nervous power, and the assimilating functions, thereby develop tubercular deposits in the lungs, as the parts most predisposed, by structure and exposure, to experience this morbid change, generally without any inflammatory precursors or complications. These races, as far as I have had occasion to observe, rarely or never present the protracted and very chronic states of the malady sometimes seen in the white races; while the more rapid or acute forms are frequently met with, but these generally with fewer indications of febrile or excited vascular action than in the white races. Hæmoptysis is, I believe, less frequently observed as a symptom or complication of the disease in the negro than in the latter races, while it is a severe and frequent symptom in the mixed races of South America.†

* [Of the blacks who escape from the Southern States to Canada, a large number perish within the first five years from tubercular and scrofulous affections.]

† Dr. ARCHIBALD SMITH, in a very interesting account

97. iv. The states of the Blood in Phthisis.—Before a precise idea can be formed of the states of the blood in this disease, the healthy conditions of the blood should be considered, with reference to *sex*, *age*, and *temperament*, in order that the degrees in which the former differ from the latter may be seen. It should not, however, be overlooked that the *chemical analyses* of Denis, Lecanu, Becquerel, Rodier, Andral, Nasse, Gavarret, Simon, &c., have presented slight differences, even at the same age, in the composition of the blood in health, so that the results at which they have arrived may be viewed rather as a close approximation to the truth than as absolute certainty. In addition to the differences arising from sex, age, and temperament, others, hitherto not inquired for, may also exist, especially those depending upon race, climate, and season. After examining the mean results furnished by the above writers, I here give those assigned by Becquerel and Rodier, as the most precise and as nearly approaching the mean of the other observers.

98. *a*. The following table, containing the mean of a number of analyses of the blood of *healthy* persons, between the ages of 21 and 55 years, shows the differences between the constituents of this fluid in *males* and *females*, in 1000 grains, or parts.

	Male.	Female.
Density of defibrinated blood	1060·0	1057·5
Density of serum	1028·0	1027·4
Water	779·0	791·1
Fibrin	2·2	2·2
Sum of fatty matters	1·60	1·62
serolin	0·02	0·02
phosphorized fat	0·488	0·464
cholestrin	0·088	0·090
saponified fat	1·004	1·046
Albumen	69·4	70·5
Blood-corpuscles	141·1	127·2
Extractive matters and salts	6·8	7·4
chloride of sodium	3·1	3·9
other soluble salts	2·5	2·9
earthy phosphates	0·334	0·354
iron	0·566	0·541

99. *b*. The differences of the constituents of the blood at different *ages* have not been determined with sufficient precision; but, according to the researches of Denis, the water in the blood is somewhat increased after 50 *years* of age, the solid residue slightly less, the blood-corpuscles are materially diminished, and the albumen nearly the same in quantity. In *childhood*, the water is increased, the solid residue somewhat less, the blood-corpuscles considerably less than at mature age, and the albumen nearly the same as at that age. Becquerel and Rodier state that, after 40 or 50 years of age, there is a decided and progressive increase of cholestrin in the blood. As puberty approaches, and as the generative organs are developed, the blood-corpuscles and iron increase, and the relative proportion of water diminishes; the corpuscles and iron serve to maintain the energy of these organs; and until the powers of these organs begin to flag, the blood experiences little or no diminution of its red corpuscles.

100. *c*. The *constitution* has considerable influence on the state of the blood. At equal ages, the solid constituents and hæmato-globulin are less abundant in the blood in weak than in strong constitutions. According to Lecanu and others, the blood of persons of *lymphatic* and *phlegmatic*

of the Diseases of Peru, states that "in Spring, a season when many severe cases of pneumonia present themselves, the commonest catarrh generally appears under a more febrile form, and when it unfortunately affects one of a consumptive tendency, it is frequently the exciting cause of a galloping decay. For at this season it is remarked that consumptive patients, with which the hospitals in Lima are well supplied, die very speedily, while at other seasons they linger on for a longer period. Persons who are habitually subject to chronic *bronchitis*, and troubled with what they call crude phlegm, or much mucous expectoration, are apt to fall into a fatal decay, as a consequence of an acute attack originating in cold; and others, who have been in a lingering state of health for some time, with a slow fever and a short dry cough, or a cough accompanied with expectoration, especially in the morning, of clear and frothy sputa, are prone to have their fever increased, and to be hurried into a state of catarrhal consumption. In cases of the latter kind, it is probable that tubercles may have previously existed in the lungs, and that the exception of catarrh only serves to bring phthisis into more decided action. And, indeed, it may be made a question whether those cases of chronic bronchitis to which I have referred may not, sometimes at least, be instances of bronchial irritation, and consequent expectoration of a mucous secretion, sustained by the presence of tubercles. Whatever be the particular form or primary character of pulmonary consumption, certain states of the atmosphere, depending on different degrees of altitude, appear to be either hostile or favourable to its existence or development, according to the particular locality in which the patient happens to reside. Thus on the coast it is a common disease, terminating in purulent expectoration and death, in whatever way it may have originated; but on the intermedial mountains, and in the temperate valleys of the interior, pulmonary consumption is a rare malady.

"A failure of strength and health coming on gradually, or as it were by stealth, with impaired appetite, a slight dry cough, with or without pain at the breast or shoulders, a febrile pulse, with nocturnal heat and restlessness, are symptoms frequently precursory of those which characterize confirmed consumption. This slow fever, so much dreaded by every one as the harbinger of phthisis pulmonalis, and often aggravated by daily provocations, or fretfulness and anger, is always accompanied, if not always preceded, by a diseased condition of the digestive functions. This affection is, I think, well described by Tissot as a disease to which men of letters are subject: 'This slight fever, to which some men of letters are liable, and which, by impairing the nutritious lymph, renders them pale and thin, and throws them at last into a state of decay and consumption, a fever which itself depends on this, that sometimes a strong mental emotion excites the action of the heart and accelerates its pulsations; but more frequently it arises from bad digestion, and a faulty condition of the chyle, which irritates the organs of circulation, and so becomes the cause of the fever; and, also, if the organs of respiration are delicate and sensible, of a cough, which, united to the fever may degenerate into hectic fever and phthisis.'—*De la Santé de Gens des Lettres*, p. 33. In conformity with these views, which are as applicable to the ordinary cases of incipient phthisis in Lima, as to the explanation of the origin of pulmonary affections in men of letters, according to Tissot, I would remark that the chests of the Limenos, especially the male part of the white population, are commonly contracted; very rarely open and spacious, except among the dark and labouring classes; and every practitioner entrusted with the medical treatment of these people should constantly bear in mind that their respiratory organs are so delicate and easily affected, that sometimes shaving and washing the face in cold water bring on catarrh; and I have already shown how this latter affection may be the precursor of confirmed consumption."—*Edinburgh Medical and Surgical Journal*, vol. liv., p. 6–9.

Dr. A. Smith has here shown the very intimate connexion of phthisis with impaired digestion and assimilation, and the want of originality, as well as the limited views of those writers who, since the days of Tissot, have espoused a somewhat similar doctrine. Of *hæmoptysis*, in connexion with phthisis in Peru, Dr. A. Smith remarks: "Spitting of blood from the lungs is exceedingly common in Lima, and not confined to persons of any particular class or colour, though more prevalent among the fairer inhabitants of European descent;" and he points out the frequency of attacks of hæmoptysis, not only as a prelude, but as an attendant upon the early stages of consumption among the several races peopling Peru.

temperaments is much poorer in solid constituents, and especially in red globules, than that of persons of sanguineous temperament—the quantity of albumen being the same in all. The following are the results in 1000 parts:

	Sanguineous Temperament.		*Lymphatic and Phlegmatic Temperament.*	
	Men.	Women.	Men.	Women.
Water	786·584	793·007	800·566	803·710
Albumen	65·850	71·264	71·781	68·660
Blood-corpuscles	136·497	126·174	116·667	117·300

101. *d.* The *chemical analysis* of the blood in threatened and incipient phthisis furnishes the same results as those stated in the article on Scrofula and Tuberculosis (§ 93, *et seq.*). When phthisis is farther advanced, the changes in the blood are more and more manifest. Andral and Gavarret state that, in all periods of the disease, excepting the last, the fibrin seems on the increase, and the red corpuscles are on the decrease, progressively throughout; but that the proportion of the increase on the one hand, and decrease on the other, varies with the progress of the malady. If the tubercles be in a crude, unsoftened state, the increase of fibrin is only small, and its whole amount may be estimated at about 4. This, however, according to the researches of Dr. Fricke, of Baltimore, and others, is too high an estimate. The decrease in the corpuscles in this stage is perceptible, but not very great. As the tubercles soften, the quantity of fibrin slightly increases, and the corpuscles decrease. Upon the formation of vomicæ, or cavities in the lungs, the fibrin is somewhat farther increased—to 5·5 according to Andral—but it never reaches the amount observed in pneumonia. The results vary, however, with the nature of the associated lesions, which most of chemical observers have not taken into the account; for the occurrence of severe attacks of hæmoptysis, or of partial, sub-acute, or chronic pneumonia, or pleuritis, or peripneumonia, will increase the fibrin and greatly diminish the red globules. In the last stage of phthisis the blood becomes still poorer; the fibrin decreases in nearly the same ratio as the other solid constituents, and even often falls below the healthy standard. The following table furnishes the results of 22 analyses by Andral and Gavarret, and 9 by Becquerel and Rodier, in 1000 parts of the blood in phthisis:

	In Men.			*In Women.*	*By Andral & Gavarret.*
	1st Venesect.	2d Venesect.	3d Venesect.		
Water	794·4	799·8	821·0	796·8	809·7
Solid constituents	205·2	200·2	179·0	203·2	190·3
Fibrin	4·8	4·2	3·6	4·0	4·4
Fat	1·55	1·4	1·06	1·729	
Albumen	66·2	65·04	62·0	70·5	
Blood-corpuscles	125·0	122·7	103·5	119·4	100·5
Extractive Matter and Salts	7·7	6·7	8·9	7·6	

102. Mr. Ancell has adduced the results of a great number of researches into the constitution of the blood in phthisis. He views the disease to derive its origin from morbid states of the blood. The chief differences existing between the views of that gentleman and those entertained by me, as stated under the head Scrofula and Tubercles (§ 101, 102), are, that I consider the changes observed in the blood, the nature and extent of which I fully admit and describe, not as the origin of tuberculosis, but as effects of originally deficient, or consecutively impaired, power of the organic nervous system—of that system which endows the digestive, assimilating, circulating, and nutritive organs—defective assimilation of the chyle, and an unhealthy condition of the blood, being the consequences of this state of the organic nervous system, and only intermediate links in the chain of pathological results, the extremities of which chain are the state now assigned and the tubercular lesions.

103. *e.* I may adduce the following as the results of my own observations of the state of the blood in the early and in the advanced stages of phthisis: At an early period, or even before the disease has fully declared itself, the blood is thinner or poorer than in health; the colourless globules are more or less abundant, and the red globules less numerous; the clot is somewhat smaller, its crasis less, and it sooner loses its cohesion. As the disease advances, and as febrile action is established, the fibrin is somewhat increased, and this is more certainly the case, if hæmoptysis, or intercurrent inflammations of any of the pulmonary structures take place; the red globules are diminished, and the albumen and fatty matter are not very materially changed in quantity. The alkaline salts are slightly deficient, and lime is somewhat in excess. It should not, however, be overlooked that, among the numerous analyses of the blood in phthisis, there are very great differences in the quantity of fibrin, of albumen, and of fatty matter. I have here given what appears to be the more correct results. Probably the quantity of each of these is not so different as the quality, the intimate constitution, and vital relations. In the last stage of the disease the blood appears still more watery, owing chiefly to the deficiency of red globules; and the colourless globules more numerous than in health. The greater abundance of colourless globules is probably owing to impaired assimilation, or metamorphosis, of these into red globules. The colourless globules in this, and indeed in earlier stages of the disease, have been mistaken for pus globules, the existence of which in the circulation is doubtful, or at least not satisfactorily demonstrated. The vital crasis, as well as the size of the clot, progressively diminishes. It does not appear that the *microscopic appearances* of the blood in phthisis are different from those now stated, or that the observations which have been made with the aid of this instrument have furnished any additional facts to those now adduced. (See *art.* Scrofula and Tubercles, § 93, 94.)

[It must be acknowledged that we are as yet imperfectly acquainted with the true nature of the tuberculous crasis. It is evidently a special *dyscrasia*, connected with causes of debility which induce such changes in the circulating fluid as to lead to the deposition of a substance exhibiting the feeblest traces of organization. This matter would seem to bear little resemblance to fibrin; and yet Rokitansky seems to regard it as a modification of fibrin, and concludes that "the arterial character—arterial elaboration of the fibrin—constitutes, above all, the cardinal feature of the tuberculous crasis." He also points out how, in consequence of the alteration of the nature of the fibrin, tubercle is continually deposited, even when the blood is very deficient in that constituent; the fibrin that is formed being soon affect-

ed by the peculiar dyscrasia, and deposited in the form of tubercle. The rapid coagulation of tubercle-blastema, which must be effused in a fluid form, its tendency, when coagulated, to soften—its formation being favoured by active arterialization, and prevented by a venous condition of the blood—are circumstances which indicate a real affinity between tubercle and fibrin. When we reflect that various debilitating causes are found to increase the quantity of fibrin, and also that the same are potent in causing the production of tubercle, this hypothesis acquires farther probability. But in a majority of cases, even before this peculiar modification of fibrin has taken place, which leads to its excretion in the form of tubercle, a special impress is stamped upon the system, which betrays to the experienced eye the approaching evil. Its phenomena mark the scrofulous diathesis, so called. There is an opposite diathesis, or condition of the blood, characterized by deficiency in fibrin and excess of albumen, and generally also of blood-globules, which is called by ROKITANSKY *venosity*, or *albuminosis*, and by SIMON *hypinosis*, and in which tubercular deposits are extremely rare.]

104. v. COMPLICATIONS OF TUBERCULAR PHTHISIS.—It is manifest that tubercles in the lungs, in their several states and stages, being the effects (as shown in the *art.* SCROFULA and TUBERCLES, § 101, 102) of originally deficient, or subsequently impaired, organic nervous power, and of the consequent changes in the blood, should not be viewed as a special disease of the lungs, or as limited to these organs only, but as a malady, in which the constitution—the whole frame, is more or less implicated. The earlier changes of organic nervous power and of the circulating fluids being such as now stated, it may be inferred that numerous associated and consecutive alterations will appear at early and advanced stages of the malady, more or less intimately connected with the original mischief, or tubercular vice, either as associated or related changes, or as more remote results. As these severally, and often in various associations, may be expected to present themselves in the course of phthisis, it becomes important that a brief view should be taken of them, as they are most frequently presented to us in actual practice, and nearly in the order as to frequency in which they occur.

105. It will appear from the foregoing, as well as from the circumstance of my not having taken particular notice of a form of phthisis, recently called *dyspeptic phthisis*—a form which Dr. A. SMITH has shown above (*see note to* § 96) to have been first insisted on by TISSOT—that I do not consider this as a variety of phthisis, inasmuch as indigestion is, as noticed by Dr. SMITH, an early attendant upon all the forms of this malady, although in different grades; and even when dyspepsia may be so slight as to be overlooked, especially as regards the functions of the stomach, healthy assimilation and nutrition may be very remarkably impaired. Original or acquired defect of the digestive, assimilating, and nutritive functions is not only the attendant upon the commencement and progress of the several forms of phthisis, but it precedes their origins in more or less manifest grades. Indeed, the malady may rationally be viewed as presenting this procession of morbid phenomena, if we admit the earliest change from health in tubercular persons, whether hereditary or acquired, to be impaired function of the ganglial nervous system, or, in other words, defective organic nervous power—a power which endows and actuates the digestive, circulating, and nutritive organs and functions.

106. *A.* HÆMOPTYSIS.—I have already considered this occurrence as a symptom of phthisis (§ 49, *et seq.*). It may also be viewed as a *complication* of this disease; and it may supervene upon tubercles of the lungs coexisting with either functional and congestive disorder, or with organic lesion, of the heart. Hæmoptysis may, however, be caused by congestion of, or impeded circulation through, the cavities of the heart, independently of the existence of tubercles in the lungs; but this occurrence is comparatively rare. The blood may proceed: 1st, as a simple exudation from the bronchial mucous membrane, in consequence of the irritation and congestion caused by the tubercular deposits, whether within or without the air-cells and capillary bronchi, and by the impediment they occasion to the circulation in the pulmonary veins; 2dly, from the surface of a cavity owing to the erosion of one or more of the vessels passing to it—a circumstance of much more frequent occurrence than was formerly supposed; 3dly, into the structure of the organ, without any previous cavity, little or even none of the blood being expectorated, asphyxia having been suddenly produced by the extravasation. (See § 134, and *art.* LUNGS, § 186, *et seq.*)

107. The hæmoptysis which takes place at the commencement or at an early stage of phthisis may generally be ascribed to the first of these pathological states; but it may also proceed from the disorders and lesions of the heart already alluded to (§ 51), either independently of, or in connection with, tubercular deposits in the lungs. It should not, however, be overlooked that the hæmoptysis may appear in females as a vicarious menstruation; and as such it may be connected with tubercular deposits in the lungs or morbid states of the heart, or with both states of disease, or it may be independent of either of these. When the hæmoptysis takes place vicariously of menstruation, the lungs are very rarely free from tubercular formations. But, in whatever mode hæmoptysis takes place, the blood, which remains for a time in the bronchi, from or into which it is effused, generally excites more or less irritation, often amounting to inflammation of the bronchial mucous surface, thereby farther complicating the malady. (See *art.* HÆMORRHAGE *from the respiratory organs*, § 96, *et seq.*)

108. *B.* BRONCHIAL IRRITATION AND INFLAMMATION.—Bronchitis, most frequently limited, but either acute, sub-acute, or chronic, is a common complication of phthisis. It may exist in one or other of these states. It is generally confined to the bronchi in a portion of one or both lungs, and more especially to the bronchi in the vicinity of, or communicating with the seats of tubercular deposits or cavities. In the first stage of phthisis, these deposits most probably occasion merely a state of irritation, or of sub-inflammation, of the mucous membrane of the adjoining bronchi; but, even in this stage, when external agents or other causes aid the operation of this pathological condition, then a more active disease of this membrane is developed, especially if one or more attacks of hæmoptysis have occurred, and sub-acute or even acute bronchitis results. The effect of this bronchitis, although limited, as now stated, is to develop the crude tubercles and to hasten

their softening. When this has taken place, and the softened tubercular matter has made its way into the adjoining bronchi, then a very obvious cause of irritation and of inflammatory action is superadded to those previously existing. Hence during and subsequent to the softening—during the second and third stages, the sputum becomes much more abundant, and its quantity is owing chiefly to the morbid secretion from the inflamed bronchi—unless, indeed, in those very rare cases when the bronchi are not materially irritated by the disseminated tubercles, or when the softened matter is absorbed and does not pass off by the bronchi. In these stages, the discharge from the surface of the cavities, or the contents of recent tubercular vomicæ, are the chief causes of the bronchitis and of its perpetuation; for it is frequently observed that the morbid appearances, both inflammatory and ulcerative, exist chiefly in, or are limited to, the bronchi communicating with the vomicæ or cavities, and that these changes may be traced in and from these bronchi to their larger trunks, until the trachea is reached, where also, as well as in the larynx, the same alterations are not infrequently observed (§ 109, 110); while the bronchi which present not this communication, or which extend only to crude tubercles, are either exempt from these changes or present them in a slight degree. Dr. CARSWELL detected ulceration even in the minute bronchi communicating with cavities, showing the extension of the morbid action from the latter by means of the discharge from them.

109. *C.* INFLAMMATION, ULCERATION, ŒDEMA, &c., OF THE LARYNX AND TRACHEA are often complications in the course of phthisis. The frequency of this association depends upon the original, concurrent, and consecutive causes, and upon influences and agents acting in the course of the malady. The affection of these parts is to be imputed chiefly to the same changes as occasion the bronchitis—to the tubercular and other discharges from the originally diseased parts; and often the morbid appearances may be traced from the bronchi communicating with cavities to the trachea and larynx. In some cases, however, the affection of the larynx, and even of the epiglottis, commences previously to the softening of the tubercles, and may be ascribed in these to the greater susceptibility of these parts, in the early stages of phthisis, to the usual exciting causes of inflammation and its consequences, and to the irritation extending to them—by sympathy and continuity from the pulmonary and digestive mucous surfaces. In the early, as well as in the advanced stages of phthisis, the digestive mucous surface furnishes many indications of irritation, giving rise to heart-burn, acrid eructations, &c., which very sensibly affect the larynx and epiglottis, and kindle disorder, which is not readily, and even never, put out. That it may thus partly originate in the digestive organs, is shown by the circumstance of the lesions being sometimes either limited to the larynx and laryngeal surface of the epiglottis, or chiefly found in these parts, the trachea being comparatively exempt or nearly so. In other cases, both these and the trachea are affected more or less; and not infrequently the inflammatory changes, ulcerative, &c., are limited to the trachea, and found chiefly either in the posterior or membraneous portion of the trachea, or towards the side of it corresponding with the cavities which exist chiefly or only in one lung. This limitation of the ulceration to one side of the trachea very probably is caused by the passage of the morbid secretion over it during the position of the patient in bed, which is most frequently on the back, or towards the side most diseased, so as to give greater freedom of respiration to the lung least affected. In some cases, the ulceration of the posterior part of the trachea is very extensive, and some of the ulcers very deep, even so much so as to give rise, in rare instances, to a fistulous opening into the œsophagus, one instance of which came under my observation. (See *art.* LARYNX and TRACHEA.) The larynx is rarely attacked primarily, or independently of tubercular deposits in the lungs; it is chiefly in connexion with tubercular disease of the lungs and with syphilis that lesions of this part occur. M. LOUIS states that of 180 persons who died of chronic diseases not phthisical or syphilitic, he found one only with ulceration of the larynx; but that one in five had ulceration of this part or of the epiglottis, and one in three had ulceration of the trachea, among those who died of tubercular consumption.

110. *Inflammation* or ulceration of the larynx is an important complication of phthisis; and when the affection of these parts is severe, and that of the lungs not well developed, or at an early stage, the disease has often been called *laryngeal phthisis*. But in those cases the affection of the larynx is merely symptomatic of the tubercular formations in the lungs, which is often masked by the former affection, especially when it is severe or the tubercular deposits not far advanced. In this state of the larynx there is either hoarseness or loss of voice, with pain in the region of the os hyoides, especially when ulcerations have advanced. The cough is characterized by a harsh, grating sound. It is difficult, suffocative, or attended by a whistling noise. The *ulcerations* in the trachea are very frequent in the more chronic states of phthisis, and are rarely manifested during life in these slow cases. M. LOUIS observed in some instances that sensations of heat and obstructions were complained of behind and above the sternum.

[It is well to bear in mind that all the rational signs of pulmonary phthisis may be present, including emaciation, profuse sweating, cough, purulent expectoration, mingled with blood, hectic, derangement of digestive organs, &c., without the presence of tubercular deposits in the lungs, but from laryngeal and bronchial disease. Such cases can only be distinguished by a careful auscultatory examination of the lungs and larynx, and actual inspection of the pharynx. In the same manner, chronic bronchitis is often confounded with, or mistaken for, simple throat disease. Dr. BENNETT has remarked very truly that, even when pulmonary tuberculosis does exist, many of the urgent symptoms are not so much owing to disease in the lungs as to the pharyngeal and laryngeal complications; and that local treatment may not only remove or alleviate these complications, but that, in conjunction with general remedies, it tends in a marked manner to induce arrestment of the pulmonary disease.]

111. *D.* INFLAMMATIONS OF THE LUNGS, *limited to portions of them, and both of these portions and of their bronchi*, especially to parts adjoining the tubercular masses, vomicæ, and cavities, often occur at all stages of phthisis. In the first stage, when the tubercles are crude, or disseminated

through the organ, the inflammatory action may, from its grade, or its congestive or scrofulous character, or from being masked by the tubercular deposits, be imperfectly manifested either by the rational symptoms or the physical signs. In this stage it is very difficult to determine whether the tubercles be the cause of the inflammatory irritation, or the latter the produce of the tubercles. It is not improbable that, however originating, the one morbid state acts, and is acted, on by the other. As the tubercles advance to softening, inflammatory or congestive appearances may be detected around them, and the same are often seen around the vomicæ or in or near the walls of cavities, the bronchi, both capillary and large, participating in these changes. In many instances the structure of the lungs is condensed or infiltrated with tubercular matter around cavities or vomicæ, the change being a result of inflammation of a scrofulous or congestive character, limited to the situations in which the tubercular deposits are, or have been, most abundant or developed. In other instances, especially at an early stage, the attacks of hæmoptysis, especially when considerable, diminish or subdue the inflammatory condition, and leave the portions of lung not yet disorganized in a better state than previously for the performance of their functions. In some cases, especially where the deposits or vomicæ are near the surface of a portion of lung, the inflammatory action in the adjoining structure extends to the pleura, giving origin to the next complication, namely, intercurrent *pleuritis*, which is very frequently associated with one or more of those already considered.

112. *E.* INFLAMMATION OF THE PLEURA—in an acute, sub-acute, or chronic form—most frequently limited, but sometimes very considerably extended—generally very sensibly expressed, but occasionally almost latent or not expressed, or rather overlooked during life, is a most common lesion in cases of tubercular consumption; for it is very rarely found on dissection that the lungs in this disease are altogether free from old or recent adhesions. The pleuritic lesion usually arises as just stated, and is in most cases manifested by the pain commonly experienced, and if not by pain, by the physical signs. The inflammation of the portion of pleura covering tubercular deposits or vomicæ agglutinates it, by the exudation of lymph, to the opposite or costal pleura, thereby preventing, unless in rare instances, the *perforation* of the pulmonary pleura, and the consequences which would follow. The lesions supervening in the pleura in the course of tubercular phthisis, and the contingent results which sometimes ensue, more especially *perforation of the pulmonary pleura*, are fully considered under the heads PLEURA, *Inflammations of* (§ 112, *et seq.*), and *structural Lesions of* (§ 201, *et seq.*), and PNEUMATOTHORAX, and to these I refer the reader for the farther elucidation of these complications of phthisis.

113. *F.* SEVERAL ABDOMINAL COMPLICATIONS are manifested in the course of phthisis, and evince the general or constitutional nature of the malady—or the origin of it in the organic or ganglial nervous influence endowing the vascular system and the circulating fluids. These complications may appear at all stages of phthisis, or they even may precede the first stage.—*a.* The complication with *disease of the digestive mucous surface* is one of the most important. The stomach, the lower parts of the ileum, and the cæcum and colon, are most frequently affected. M. ANDRAL justly remarks that "softening of the mucous membrane of the stomach, hyperæmia of the different portions of the intestines, ulceration of the small intestine, accompanied in many instances by a development of tubercles, are all of such frequent occurrence in phthisis, that they may fairly be considered as constituent parts of the disease." These lesions of the digestive canal most frequently occur in the course of the pulmonary disease, often not until an advanced stage, especially in persons somewhat advanced in age; but they sometimes precede it, particularly in children and younger subjects; and, in some cases, the pulmonary and abdominal affections appear to commence at the same time or nearly so.

114. (*a*) This is more especially the case as respects the complication with *disorder of the stomach*. At the commencement of phthisis this complication is usually of a dyspeptic character; but it may, as the disease advances, or even from the first, assume a severer form, and be attended by nausea, pain, or vomiting. Tenderness, a sense of heat or burning pain, increased by pressure, are present in these cases, and may arise either from inflammatory softening of the villous surface or from ulceration. These symptoms and lesions, although early observed in some cases, the vomiting and pain occasionally being severe and obstinate, commonly appear in the second or third stages of phthisis—oftener in the third. As far as my experience extends, young females have more frequently presented this association than males. *Increased size of the stomach* was observed by M. LOUIS in more than two thirds of the cases examined by him after death, while only two instances of it were seen in 230 subjects who died of other diseases. In some cases the organ is double or treble its natural capacity, descending in these as low as nearly to reach the pelvis, its coats becoming thinner in the ratio of its increased size.

115. (*b*) *Disease of the intestines*, chiefly of the follicles of the lower portion of the ileum, commencing with tubercular deposits in the solitary and agminated follicles, and terminating in ulceration of these, is a very common complication of phthisis. The follicles are first distended, enlarged, and projected on the mucous surface by the tubercular deposit; they afterward burst, discharge their contents, and ulcerate, the ulcers being seated chiefly in the patches of agminated follicles in the lower portion of the ileum, and in the side opposite to the attachment of the mesentery. In the large intestines, especially the cæcum, the ulcerations are disseminated irregularly. The small ulcers in the ileum generally coalesce, and the ulcers often pass under the mucous surface and detach portions of it. They often proceed deeply, as shown in the article on the DIGESTIVE MUCOUS SURFACE (§ 36, *et seq.*), but they rarely perforate the intestines in phthisis, for as soon as they approach the peritoneal surface, lymph is thrown out on it, and the nearly perforated part is agglutinated to the opposite peritoneal surface. This lesion of the intestines is generally attended by the obstinate diarrhœa which occurs in the second and third stages of phthisis, in the latter especially, and has usually been termed *colliquative diarrhœa*. It is chiefly to be ascribed to two morbid conditions, or to either of

them, namely, to the existence of tubercles in the intestinal follicles, or to disease of these follicles excited by the morbid states of the blood, in the course of the elimination of the morbid elements from this fluid by these follicles.

116. The earlier the ulceration of the intestines takes place in phthisis, the more rapid in general is the progress of the malady, and the loss of flesh and strength of the patient. In the more chronic and protracted cases, this lesion seldom supervenes until shortly before their fatal termination. M. LOUIS states that he found tuberculous ulceration of the small intestines in five sixths of the cases he inspected, and almost as frequently in the large intestines, the mucous membrane being often red, thickened and softened in about one half of these cases. In the whole number of phthisical bodies examined by this physician, the large intestines were in a healthy state throughout their extent in three instances only. In the cases which I have inspected, I have always found the *cæcum* more or less ulcerated; and in some I had reason to infer that this portion of the canal was the first to be affected; perforation of the cæcum and pericæcal abscess, or fistula, having taken place in two cases in which I was consulted.

117. (*c*) The *mesenteric glands* are often found tuberculous, especially in young subjects, and in connexion with tubercular ulceration of the intestinal follicles. In the phthisis of very young children these glands are rarely exempt. PAPAVOINE says that he found this lesion in one half of the cases of phthisis in children. This proportion is less than I have remarked in this class of subjects. In adults, LOUIS found these glands tuberculous in one fourth only.

118. (*d*) The *liver* is found remarkably changed in a very large proportion of phthisical cases. This change consists in the deposition of *fat* in its structure, this organ becoming enlarged, fawn-coloured, and of diminished consistence, in proportion to the amount of fatty degeneration. The fatty or oily nature of this change is at once shown by the scalpel on dividing the liver, or by pressing a portion of it on paper, or by subjecting it to heat. The organ is equally changed throughout, and with a rapidity nearly equal to that of the tubercular malady, with which this alteration is intimately connected, and upon which it is dependent. M. LOUIS states that of 49 cases of this degeneration, 47 occurred in tubercular phthisis; while of 230 subjects of other diseases, nine only presented this alteration of the liver, and seven of these had tubercles in the lungs. He farther remarks, that it is independent of the patient's age, and of any known cause excepting the existence of tubercles; and that it is not attended by any evident symptom except enlargement, the functions of the organ not being disturbed. Sex appears to influence its occurrence, as of the forty-nine cases seen by LOUIS only ten were males. The most remarkable instances of this alteration in connexion with phthisis which I have seen occurred in females addicted to the abuse of spirituous liquors. In a young female who was thus addicted from childhood, who had never menstruated, and had died of phthisis about the age of nineteen, the fatty, fawn-coloured liver was so remarkably enlarged as to fill the abdomen, the lower edge of it pressing upon the bladder and pelvic viscera, the organ nearly equalling in weight the whole body. In these cases, tubercles are rarely found in the liver, unless in children. From my own observation, and from a remark made by Sir J. CLARK, this change of the liver is not so frequently seen in phthisical subjects in this country as in France, yet functional disorder of this organ is often observed in the course of phthisis.

119. *G. Various other lesions* take place, especially in the advanced course of phthisis, but these are merely contingent occurrences, and seldom or even rarely met with. The most important of these are lesions of the heart, in rare cases, occasioning sudden death in the course of phthisis, obstruction of veins from coagula in their canals, hæmorrhoids and fistula in ano, tubercular and granular lesions of the urinary organs, and disease of the sexual organs. These require merely a few passing remarks.—*a. Softening and slight dilatation* of the ventricles is sometimes observed in the course of phthisis. In the case of a lady, death took place suddenly in the second stage of the chronic form. The body was examined in my presence, and the only apparent cause of the sudden dissolution was this alteration of the heart. I have, however, seen this change in other cases of phthisis; but, although it may have accelerated the course of the malady, sudden death has not appeared to have been caused by it.

120. *b. Coagula in venous trunks*, especially in the extremities, form in rare cases at an advanced stage of phthisis, occasioning great œdematous swelling of the limb, and are the results of the morbid state of the blood and of impeded circulation in the venous trunks rather than of inflammation of these vessels.

121. *c. Hæmorrhoids* are occasionally a complication of phthisis, and are produced as much by one of the most frequent causes of the latter as by irritation of the rectum by frequent action of the bowels, and by interrupted or impeded circulation in the portal vessels, namely, by masturbation, which determines the circulation to the structures in the vicinity of the anus, and which, with one of its consequences, constipation of the bowels, favours congestion of the hæmorrhoidal veins.

122. *d. Fistula in Ano* sometimes occurs in the course of phthisis, more frequently in the early stages. It may be imputed to the same causes as produce hæmorrhoids. It has the effect of prolonging the duration, or, to a certain extent, arresting for some time the progress of phthisis. Hæmorrhoids, when they discharge at intervals, have a similar effect to fistula in ano on the progress of the disease, as I have observed in several cases.

123. *e.* Alterations, more particularly tuberculosis, of the *urinary* and *sexual* organs, seldom supervene in the course of phthisis, although the functions of these organs, especially of the uterine organs, are more or less disordered. Tubercular formations are sometimes formed beneath the mucous surface of the urinary passages in the phthisis of children; and in female adults the catamenia are generally delayed, painful, or suppressed in the advanced progress of the malady, which generally assumes a more severe and rapid form when this disorder supervenes. In a case of a young lady, who died about the age of twenty of phthisis, and who had never menstruated, the body was inspected in my presence, and the ovaria were found very small, and their coverings thickened and almost of a fibro-cartilaginous density. The disease had been attributed by me to mastur-

bation, the non-appearance of the catamenia, and the alterations of the ovaria, probably having been caused by this most noxious vice.

124. III. Pathological Anatomy of pulmonary Tubercles.—On opening the thorax after death from phthisis, the lungs generally do not collapse, or collapse imperfectly. They are more or less increased in weight, in some cases very remarkably. Dr. Clendenning found the average weight of the healthy lungs of an adult to be 46½ ounces; and Dr. Boyd, as stated by Mr. Ancell, ascertained that in a considerable number of adult males the average weight of tuberculated lungs was 72½ ounces. The increase is due partly to the tubercular deposit, and partly, in various degrees, by an increased quantity of blood in the vessels, the secretion of tuberculous pus, serous effusion, red or gray hepatization of the lung, or extravasation of blood.

125. In the early stage of uncomplicated phthisis, when the tubercles are distinct, the pulmonary tissue is crepitant around them, and those which are most superficial somewhat raise the pleura. Distinct tubercles in the lungs, according to Hasse, are never larger than hemp-seeds; when they are described as larger, a congeries must be understood. *Gray* and *yellow* crude miliary tubercles seldom coexist in the same lung, unless they are deposited at distinct periods. (See Scrofula and Tubercles, § 65–90.)

126. i. *The seats of tubercles in the lungs* are somewhat different in adult and young subjects. In adults tubercular deposits are chiefly aggregated in the upper lobes. Miliary tubercles are most abundant in the posterior parts of the lungs, and through the parenchyma at some distance from the pleura, but there are many exceptions to this distribution. In children the whole lung, or large portions of both lungs, are the seats of deposits, which have appeared to have taken place about the same time. Carswell attributed the earlier and the more abundant formation of tubercles in the apices of the lungs to the motion of these parts being more limited than those of the lower lobes. The former also are more exposed to the influence of cold externally, and are more accessible to the air in its varying state of temperature and humidity. Louis, Andral, and others consider that tubercles are more frequent in the left than in the right lung. Hasse, however, disputes this, but I believe with insufficient reasons. The question as to the tubercular deposit being *within* the air-cells, or *external* to them, or, in other words, in the parenchyma of the organ, is still disputed. Magendie, Carswell, Schröder Van der Kolk, and Rainey contend for the former; while Andral, Ancell, and others consider that tubercles may occur in either of these situations, and in any tissue where nutrition or secretion takes place. According to Mr. Rainey, the earliest indications of tubercles in the lungs are deposits of a transparent, or grayish, or yellowish substance in the air-cells, sometimes completely filling and distending them, the minute blood-vessels of the parietes of the cells surrounding the deposits being still perceptible. The deposits sometimes occur in a few only of the cells, but more frequently they fill all the cells of one lobule; and in this case they press upon these vessels, which soon disappear, the whole lobule appearing, after a while, entirely formed of tubercular matter. Tubercles in the lungs thus, according to Carswell, originally assume the shape of the air-cells, and are somewhat acuminated in proportion to their projection into the bronchial tubes. When they have been of slow growth, or are deposited in large groups, and occupy numerous cells of a lobule, they resemble the sprout of a cauliflower, the pedicle occasionally extending far into the bronchial tube. In the lungs of ruminating animals tubercular matter is often seen plugging up the bronchial tubes. As the tubercle increases in size, the central parts become farther removed from the vessels by which this matter is deposited; and consequently these parts have the greatest tendency to lose their vital cohesion, and they consequently are softened, this process generally beginning at or near the centre of the tubercle. (See Scrofula and Tubercles, § 78, *et seq.*)

127. ii. *The distribution of tubercles in the lungs* varies much with the age of the patient and the form of the malady. In adults, in the usual and more chronic forms, the tubercular deposit commences, although in different amounts, generally in the apices of both lungs, and descends gradually downward to the lower lobes, the larger and older cavities existing at the apices, smaller ones lower down, and accumulations of softened or crude tubercles, or of both, at the base. This cannot, however, be viewed as an absolute law. The tubercles also in one lung, as the left, may be generally farther advanced in all their stages than those of the right. Besides, one portion of a lung may be the seat of cavities or softened tubercles, all the rest, or the greater portion, of the lung being quite sound. Tubercles which are formed rapidly are generally miliary, and nearly equally dispersed through the lungs. In the more acute states of phthisis they are thus deposited, or are infiltrated more or less extensively or densely.

128. iii. *Lesions of the Lungs associated with Tubercles.—A. Pneumonia*, or inflammation of portions of the lungs, and its usual consecutive changes, are often found associated with the several stages of tubercles. The inflammation may have passed on to red or gray hepatization, and it may have preceded the tubercular deposits, or may have been consequent upon them, induced by the usual causes of pneumonia; or it may have been produced by the irritation developed and kept up by these deposits. It should not be overlooked that the changes taking place in the lungs of scrofulous subjects during inflammatory action may be attended by tubercular formations. Yet this may not necessarily be the case, and these formations may exist in the lungs even of scrofulous and sanguineous temperaments without inflammatory action in the lungs being produced by them, this action being chiefly a contingent or intercurrent result of causes unconnected with the tubercular disease.

129. *a.* According to Louis, Grisolle, Hasse, Ancell, and others, *inflammation primarily attacking* the scrofulous subject may produce an exudation of lymph differing from the exudation occurring in pneumonia affecting the healthy person, chiefly in its tuberculous characters, and the disease may run its course, and the exudation may be absorbed; but as frequently, perhaps, the pneumonia of scrofulous subjects is followed by tubercular deposits and their usual consequences. Rokitansky calls this latter change hepatization with tuberculous deposit, which, not being absorbed, or becoming purulent, ultimately passes

into yellow tubercle. According to HASSE, this alteration is found more frequently in males than in females, and in persons from 18 to 25 years of age, than earlier or later in life.

130. The alterations produced by *consecutive* or *incurrent inflammation* of portions of the lungs during the progress of phthisis is manifestly much more frequent than the primary form. LOUIS states that he observed the results of the first stage of inflammation, commonly occupying a limited space of the lungs, in 23 out of 123 cases, and the stage of red hepatization, generally in the lower lobe, in 18 cases. He regards the invasion of pneumonia in these cases as preceding death only a few days, and not peculiar to phthisis, as he observed it as frequently in deaths from other chronic maladies. Although the patient may die of pulmonary tubercles without any inflammatory appearances, yet the tubercles are very liable to irritate and inflame the surrounding tissues, and to render the patient more susceptible of the operation of the usual exciting causes of inflammation.

131. *b.* This secondary pneumonia generally assumes the *lobular* or *vesicular form*, and seldom appears until the tubercles have been developed, or have formed aggregated masses, and occasioned irritation in the surrounding structure. The matter exuded by this state of inflammatory action around the individual tubercles or masses is generally peculiar, scrofulous, and gelatinous, the spaces between being healthy. Sometimes, however, the inflammatory changes are not limited to the patches around tubercles, but extend to the vesicular structure of an entire lobule, and pass on to red or gray hepatization, or even assume in parts a yellowish colour, the pulmonary structure being quite impermeable to air, firm and friable, the tubercles contained in it being more or less softened. In this state of the disease, the associated or intercurrent inflammation presents the usual scrofulous characters, modified by the peculiar structure and antecedent tubercular deposit.

132. *c.* The alterations found after death from the *acute form of phthisis* (§ 84) present many of the appearances consequent upon inflammation of an acute form in the scrofulous diathesis, associated with tubercular deposits, either antecedent to or coeval with the inflammatory action. As in other cases of inflammation in cachectic or unhealthy constitutions, the changes produced by it are peculiar, being diffused, œdematous, and marked by loss of the usual vital cohesion of the tissues. HASSE has well described the appearances in these acute cases. He states that one or both lungs are diseased. I have always found both lungs remarkably affected, although not to an equal amount or extent. In very marked cases the lungs, from their apices to their bases, are loaded with isolated miliary tubercles, mostly yellowish and soft, but sometimes grayish and more solid. The yellow and soft tubercles are in the centres of red or gray hepatized structures, while the gray are imbedded in a texture loaded with a bloody serum. The lungs are tumefied, do not collapse when the chest is opened, are very dark-coloured throughout, preternaturally soft, and gorged by dark fluid blood and serum. The tubercles have every where the same appearance; the pulmonary structure around them, for about a line, is more or less altered, the intervening structure being still permeable. The bronchial mucous surface is either dark-red or violet. Recent adhesions between the surfaces of the pleura are not seen. If adhesions exist, they have been formed previously to this disease. When the malady has been slower in its progress, the tubercles are more united into groups, or are more densely crowded at the apices and superior lobes than in the lower lobes.

133. *d.* In the more *chronic and usual forms* of phthisis, the alterations often associated with the tubercular deposits are those which are clearly attributable to chronic inflammatory action, and consist of hepatization of a red or gray colour, or of varieties of hue of which these are original types. The parts thus altered are dense, impermeable to air; the bronchi are filled with a dense whitish matter, and the natural structure cannot be traced, the part being firm, but friable, or readily torn. The cut surface is speckled with gray inclining to yellow, is diversified with white stripes and arborescent black patches, and is devoid of the granulations of acute pneumonia. The incision is not followed by any exudation, and pressure yields only a little turbid grayish fluid. The inferior lobe of one or both lungs is thus chiefly affected; the alteration proceeding upward, and meeting the tubercular deposits as they advance downward. According to HASSE, this associated inflammatory alteration, which differs from the effect of common pneumonia in the induration of the lung, invades only the lower portion of one lung only, while the tubercular deposits exist in both.

134. *B. Extravasation of blood* in tubercular lungs is met with in either a fluid or clotted state. 1st. It may occur as a simple exudation from the bronchial mucous surface; 2d. It may proceed from ulceration of the bronchi; 3d. Blood may be infiltrated into the parenchyma of the lungs in connexion with congestive pneumonia complicating tubercles; 4th. It may be infiltrated not only into the parenchyma, but also into the air-cells; 5th. It may be effused from a laceration of the structure of the lung; 6th. It may be effused from the ulceration of a number of capillaries in the parietes of a cavity, or of one large vessel; and, 7th. It may proceed from the rupture of a cavernous band, or of a vessel or vessels in such band. In most of these the blood is found either in a frothy or fluid state in the trachea and bronchi, or partially coagulated; and coagula are contained in cavities, and sometimes in the bronchial tubes. In these several forms, excepting the two last, the effused blood may become the seats of tubercles. Extravasation of blood is met with in all stages of tubercular phthisis. According to HASSE, it is found chiefly where tubercles have been rapidly formed in connexion with inflammatory action, or when the lungs are replete with densely clustered tubercles. CARSWELL considers that the sanguineous effusion is in many cases owing to the compression of the pulmonary veins by the tubercular masses, and to the consequent prevention of the return of the whole of the blood sent to the organ. Both of these explanations may be correct as respects different cases.*

135. *C. Œdematous infiltration* of the lung is sometimes seen, but generally only to a small ex-

* [Pulmonary apoplexy, or effusion of blood into the cellular tissue of the lungs, is very often a result of obstruction incident to heart-disease. It may coexist with tuberculosis, where death will often be sudden and unexpected; but pulmonary tuberculosis is rarely associated with cardiac lesions involving obstruction, and this is an important diagnostic fact.—*Am. Ed.*]

tent, and chiefly in the acute form of the disease, in the more cachectic and phlegmatic habits; or when phthisis is complicated with disease of the bronchial glands, or of the kidneys. Rilliet and Barthez consider that serous congestion or œdema of the lungs is sometimes connected with the deposit of tubercles in children; that it may be produced by this deposit; but that it most frequently depends upon compression of the vessels by enlargement of the bronchial glands.

136. *D. Emphysema.*—Vesicular emphysema is frequently found in tubercular lungs, in chronic cases, in connexion with various other lesions, chiefly in the superior and anterior parts. It occurs at an early stage, generally in a diffused form, and is produced by the pressure of disseminated tubercles upon the minute bronchi; the more powerful act of inspiration filling the cells, while the less powerful expiration fails in emptying them. Emphysematous portions of the lungs rarely contain tubercles. But this alteration is seldom found to a great extent, and generally in cases where it had not been detected by the physical signs: "it is usually seen in the upper parts of the lungs, and often in conjunction with cicatrized and collapsed portions. The healing process, by absorption of the more liquid parts of tubercles and of tubercular vomicæ, by shrivelling the remainder, by cicatrization of the ulcers, and obliteration of blood-vessels and bronchial tubes," produces a vacancy in the space within the thorax, and this space is gradually, or more or less, filled up by the sinking inward of the walls of the chest, and by the dilatation of the air-cells in the adjoining still permeable portions of the lung; this latter result sometimes preventing the occurrence of the falling inward of the parietes of the thorax.

137. iv. *Softened or liquefied Tubercles.*—I have stated above (§ 126) the views of Mr. Rainey as to the softening of tubercles; and those of Laennec, Louis, Schröder, Van Der Kolk, Hasse, and others have been stated in the article Scrofula and Tubercles (§ 78, *et seq.*). It is not improbable that the process of softening may not be limited to one only of the modes contended for by these pathologists, but that when it commences or proceeds in the centres of the tubercles, it may also be advancing in their circumferences, owing to the irritation produced by them, and to the fluid effused from the irritated tissues surrounding them; the softening thus advancing from the centre to the periphery, and from the latter to the former of the tubercle. Generally it is found that softening of tubercular deposits first takes place, conformably with the progress of the deposits, in those nearest the summits of the lungs, and proceeds downward. With the process of softening, the pulmonary tissues surrounding the tubercles become more vascular, and inflammatory or congestive changes take place, extending more or less in the parenchyma, and ultimately to the pleura, as already shown (§ 111, 112, *et seq.*). The results of the softening are, discharge of the liquefied matter into the bronchi communicating with these tubercles, and the formation of a cavity, which enlarges by successive tuberculation and softening, by continued discharge, and by the coalition of two or more softened tubercles and small cavities.

[Rokitansky calls the yellow tubercle the *croupo fibrinous*, in opposition to the gray, which is regarded as simply fibrinous. The former undergoes two changes: 1st. *Cretification*, which consists in the gradual deposition of calcareous particles in the tubercular mass, with simultaneous absorption of the animal matter, thus constituting a hard, irregular mass, surrounded by indurated tissue; 2d. *Softening*, where the texture of the mass becomes more lax and moist, till it eventually breaks up into a yellowish, diffluent, cheesy mass, which finally becomes a thin, whey-like fluid, of acid reaction, and containing minute flocculi. Softened tubercle, when examined with the microscope, is found to consist, 1st. Of a fluid loaded with diffused granulous matter; 2d. traces of altered nuclei and cells; 3d. free oil, in the form of various-sized drops, and debris of the tissues. The *gray tubercle*, according to Rokitansky, undergoes only a kind of drying up into a horn-like substance (*obsolescence*). In some cases it is also the seat of tuberculous deposit. The gray tubercle would seem to be essentially distinct from the yellow; and when it undergoes softening, it is owing to the changes in the yellow tubercle, which is often mixed with it. The same author has called attention to the fact that the behaviour of the two kinds of tubercle corresponds with that of the fibrin, from which they seem to be derived, the gray resembling healthy fibrin in its tendency to contract and shrink up into an indurated mass; the yellow, like the croupous fibrin of coagula and exudations, tends to soften and break up into a fluid substance, the softening commencing, in both instances, in the central portion. The softening is undoubtedly aided by the hyperæmia, and consequent effusion in the pulmonary tissue surrounding the tubercular mass; but the tendency to softening differs very greatly in different cases, and is probably proportioned to the extent of the tuberculous crasis. Where this is great, the softening will go on very rapidly, and a cavity be speedily formed; but where the *dyscrasic* condition of the blood is slight, or improved by proper treatment, then there will be an exudation of fibrin, which will be developed into the so-called induration tissue, or fibroid callus, which either surrounds the tubercle, or forms a wall to and contracts the cavity, if one has already formed, thus favouring cicatrization. We speak now of cases where tubercle is deposited in *tuberoid* masses. The exudation of tubercle-blastema may take place very gradually, or with great rapidity; in the latter case it is usually associated with hyperæmia and inflammation, and tends rapidly to softening and decay.

It is believed that the *cancerous* crasis excludes the tuberculous. Typhus and the exanthemata rarely attack the tuberculous, though they are often followed by tuberculous disease. Sufferers from intermittents, goitre, and rachitis are seldom liable to tuberculous affection; and Rokitansky thinks that an especial immunity against tubercle is afforded by an abnormally venous condition of the blood from whatever cause; as congenital malformations of the heart or great blood-vessels; morbid alterations of the same; deformities of the chest, producing contraction of its cavity; annihilation of the function of one lung by pleuritic effusion; abdominal growths, preventing the free descent of the diaphragm; chronic pulmonary catarrh; emphysema and bronchial dilatation; pregnancy, &c.; all which conditions interfere more or less with the due oxygenation of the blood. Tuberculous and scrofulous matter have the same elementary composition, undergo the

same changes, are produced in the same way, and produce the same effects on the tissues in which they are deposited, and hence may be well regarded as identical; and the organs are the seat of tubercle in the following scale of frequency: lungs, intestinal canal, lymphatic glands, larynx, serous membranes, brain, spleen, kidneys, liver, bones, periosteum, uterus, Fallopian tubes, testicles, prostate gland, spinal cord, voluntary muscles; except in children, where the order is lymphatic glands, spleen, lungs, brain, &c.]

138. v. *Tubercular Cavities and Vomicæ.*—*A.* Tubercular vomicæ, as Mr. Ancell justly states, are either, 1st, pulmonary; 2d, pleuro-pulmonary; 3d, broncho-pulmonary; or, 4th, broncho-pleuro-pulmonary, according to their connexions with the principal structures of the lungs. The most frequent *seat* of vomicæ and cavities is the summit of the superior lobes of the lungs. They are sometimes seen only on one side, tubercles on the other side being still crude or softening; but when the disease is of long duration they have formed on both sides. When they are found in the lower lobes, or at the base of the lung, they are generally more numerous, larger and older in the summit. Proceeding from above downward, the following grades or succession of tubercular alterations are observed: 1st, old cavities, with firm or almost smooth parietes, generally empty; 2d, more recent cavities with tuberculous deposits in their walls, or softened irregular parietes, containing matters about to be noticed; 3d, softened tubercles, either isolated or aggregated; 4th, crude tubercles; 5th, semi-transparent gray granulations; and, 6th, healthy crepitant lung. This succession arises from the progressive development of the tubercular deposit from the summit to the base. The cavities are generally seated deep in the lung, but in some cases they are superficial or near to the pleura. In the former case they commonly open into the bronchi; in the latter they are disposed to perforate the pleura, but are prevented by the adhesions formed by this membrane (§ 112). Large excavations are usually seated nearer to the posterior than to the anterior surface of the lungs, where they extend to the interlobular fissure, and even sometimes communicate with other cavities in the lobe below.

139. *B. The dimensions and form* of the cavities vary much. Their size varies from that of a pea to that of a large orange; small cavities are generally spherical or oval; but as they enlarge, their form is more irregular, owing to the softening and disorganization of the parietes having proceeded more rapidly in one direction than in another. Where several large cavities communicate, one unequal and sinuous excavation is formed, sometimes with fistulous tracts, and is very irregular in shape, direction, and size, but terminating in one or more ulcerated bronchi. The *number* of cavities is often considerable, the largest frequently arising from the union of several small ones. A single excavation is comparatively seldom met with. A cavity is surrounded by crude miliary tubercles, with very rare exceptions.

140. *C. The contents* of excavations may be air; or viscid, purulent, or sanious fluids, containing whitish, curdy, tubercular matter, more or less softened; or purulent secretions of a dirty grayish, or yellowish, or yellowish-green colour, sometimes streaked, tinged, or mixed with blood; or blood more or less pure, fluid or coagulated. The fluid puriform contents are sometimes fetid, owing to their long retention, a communication with a bronchus not having been formed. Old cavities are often empty; recent ones frequently contain purulent or sanious matters, and the softened remains of tubercles. These matters are thus the secretion from the parietes of the cavity, and the debris of tubercles and of the surrounding tissues, altered more or less by retention in the cavities or by the action of the air. Fragments of the pulmonary structure are seldom found in the excavation, but when seen they are more frequently attached to, than detached from, the parietes. Bridles or cords are occasionally found stretching across a large cavity: these consist of *blood-vessels*, whose coats had become inflamed and thickened, their contents coagulated, and, having resisted the disorganizing process of the adjoining tissues, had been reduced to cords.

141. Hasse describes the blood-vessels forming bands across cavities as often having their coats reduced to a single, uniform, lardaceous substance; and their canals, which still continue, although narrowed, become eventually filled with a thin, reddish, fibrinous plug. The bands, or cords, thus formed by the blood-vessels are, in rare cases, either partially destroyed or torn asunder, before their canals are completely closed; and thus the more violent attacks of hæmorrhage ensue, and often prove fatal, the cavity and bronchi corresponding being found full of coagulated blood, and which also often fills, in a frothy state, the trachea. The *bronchi* are early destroyed; but, even when completely ulcerated, they often do not admit air into the cavity, nor the exit of the matters contained in a cavity; for they are plugged by lymph formed within the parts nearest the cavity, or by tubercular matter or deposits formed within them. The bronchi are not found in these bridles, which are thinner in their middles than at their extremities, the former having been longer exposed to the morbid processes.

142. *D.* The *parietes of cavities*, when recent, are merely the pulmonary tissues somewhat condensed by exuded lymph, or infiltrated with a grayish matter, or with gray granulations and crude tubercles. They are very rarely smooth, and formed only of the condensed pulmonary texture. In rare cases they are coloured by a brownish or blackish melanotic deposit. External to these parietes, which may not extend above a line or two into the pulmonary structure, the parts immediately surrounding them are healthy and crepitant. Somewhat older cavities are lined with a slightly adherent and soft false membrane. This lining is friable, white or yellowish, resembles concrete pus, and has no vascular connexion with the surrounding tissues. It seems as a deposit on the surface of the cavity from the matters therein contained. In still older cavities, external to this deposit, a membraneous, organized layer, of a grayish fibro-cellular substance, is formed, and is closely adherent to the pulmonary structure. This constitutes the true cyst or parietes of the cavity. This capsule becomes after a time more organized, and, from fibro-cellular, it is fibro-serous, semi-transparent, and in patches, or more extensively fibro-cartilaginous, unless where bronchi pass into the cavity. These latter changes are observed only in very old cavities; and vary in colour, vascularity, density, and appearance, with their duration. The internal surface of these parietes or capsules no longer presents the concrete matter first deposited, and forming the ear-

ly false membrane, but appears, at a much later period, smooth or velvety, and of a pearl-gray, pinkish, or reddish hue.

143. *E. The discharge or the absorption of the contents of vomicæ* are matters of interest. The *discharge* takes place by means of the bronchi, which are destroyed in the seats of vomicæ, and which become irritated, inflamed, and ulcerated by the matters formed and passed along them; the discharge from the bronchi, communicating with cavities, being often greater than that proceeding from the latter. When the matters contained in vomicæ are long retained without having communicated with bronchi, they often become very offensive and irritating to the bronchi and trachea during their discharge, and occasion the inflammatory appearances observed in these parts.

144. *F.* The *absorption* of the contents of cavities may be inferred when they are found empty, without any manifest communication with bronchi—when this cannot be detected upon dissection, and when the history of the case furnishes no proof of the discharge of these contents during life. I have already alluded to instances of acute phthisis which terminated fatally without expectoration and cough, but preceded by the typhoid symptoms characterizing contamination of the blood by the absorption of morbid matters; and in those the cavities, generally small, were empty, their parietes being soft, or covered by a semi-concrete puriform substance.

145. *G. The healing processes presented by tubercles of the lungs* have been described by Roget, Boudet, Laurence, Bayle, Bennett, Ancell, and others. Hasse conceives that the cicatrization of tubercles cannot take place if the amount of tubercular deposit be considerable or great, and if the softening be, as it usually is, attended by the continued formation of tubercles. The degree, or the procession, of morbid change in the lungs admitting of remedy cannot be defined, even if both were objects of precise observation. The states of organic nervous power and of the circulating fluids should be viewed as the chief sources, from which the local lesions are to derive reparation. And this end can be attained only by supporting this power, by enabling it to improve the digestive and assimilating processes, and thereby rendering the circulating fluid more vitalized, and less capable of forming or perpetuating the tubercular deposits. Under the influence of this system, and of the improved condition of the blood, morbid products are more sparingly formed; those which are formed have their more fluid parts absorbed; they are consequently atrophied, and their more solid, earthy, or saline parts, as respects tubercles especially, alone remain, either in a passive or inert state, and are increased by subsequent depositions, or exist in such condition as gradually advances their discharge. This is the course usually pursued in the removal of tubercular deposits before cavities are formed, and has thus been termed the process of *cretification* (§ 146, 147).

146. *a.* As regards *the formation of these concretions* it may be inferred that the organic elements of tubercle are absorbed, and carbonate and phosphate of lime deposited in their place; so that the concretions cannot be viewed as the mere solid remains of the pre-existing tubercles. Hasse remarks that the calcareous deposit, in some cases, especially in young subjects, takes place somewhat rapidly, the outside of the tubercle being then changed into a hard crust, while the central part retains its softness. Occasionally the calcareous matter appears to have been deposited at intervals, producing a series of hard, distinct, superimposed strata. Most frequently when the process advances slowly, the tubercles appear like to moist chalk. Thus the volume of the entire mass continues to diminish, so much so that a considerable portion of lung, as may be inferred from the size of the bronchi leading to it, becomes reduced by obliteration and shrivelling, to a hard shell, holding in its centre a chalky tubercle no bigger than a pea. This healing process is by no means rare, its traces being often found in the lungs of very aged persons who have died of different maladies, and not unfrequently also in much younger subjects.

147. *b. Tubercular cavities heal* in the same manner whether they are connected with several bronchi or shut out from the air-passages. In the latter case exactly the same capsule, resulting from inflammatory induration of the surrounding structure, is found, wherein the enclosed tubercular mass is converted first into a chalky pulp, and ultimately into a *hard calcareous concretion*. The majority of these concretions originate in the small and still closed cavities. They are irregularly shaped, with a granular, rough surface, are hard or friable, and often contain mealy or soft nuclei. They are found most frequently at the summits of the upper and of the lower lobes, firmly impacted within a shrivelled and condensed structure. "In rare instances the residue of tubercular matter, left within the larger cicatrized cavities, is by degrees converted into earthy granules. These are loosely held within the scar-contracted cavity, where they mingle with tubercular and muco-purulent fluids, and may become ejected during a violent fit of cough, provided the implicated bronchial tubes still remain open."—Hasse, &c., p. 340.

148. *c. Cavities cicatrize* in different ways. They may disappear altogether, or contract only to a limited extent. In the former case they are united and filled by a cellulo-fibrous substance. In this case the membraneous lining or paries of the cavity becomes thickened by a deposition of plastic exudation or lymph, either upon its external or internal surface, most probably upon the former. The membrane thus grows and contracts towards the centre, until the cavity is filled with a fibro-cellular substance. The gradual obliteration of the cavity is farther effected by the condition of the adjoining parts. If the vomica be near the surface of the lung, the pleura becomes much thickened, and the walls of the thorax sink inward, so as to favour the shrivelling process. The corresponding bronchi are closed, and the healing of the cavity is effected, the remaining scar being either thick, or roundish, or elongated.

149. When the cavities contract only to a limited extent, and simply lose their original characters, their walls are moulded out of the aforesaid layer of shrivelled parenchyma, which now neither contains nor secretes tubercular matter. "These extinct vomicæ are frequently seen at the apex of the lungs, and might readily be taken for mere bronchial dilatations, were their real nature not disclosed by the relations of the surrounding pulmonary texture, by the coexistence of cretaceous masses, and, above all, by the character of the membraneous lining, which essentially dif-

fers from, and does not immediately unite with, the mucous coat of the bronchial tubes." This internal lining usually adheres firmly to the indurated walls of the cavity, and is either thick, reddened, and velvety, or pale, smooth, and thin.

150. The state of the pulmonary structure, both adjacent and more remote, is influenced by the above healing process; and the consequent changes are well described by HASSE. The inflammatory exudation upon which the above alterations depend often involves the whole of the apex, if not the entire upper lobe of the lung, while the collective bronchial tubes degenerate into white, thread-like ramifications. The involved parenchyma of the lung is now converted into an almost cartilaginous mass, impervious to the air, very scantily supplied with blood-vessels, and presenting, when cut, a smooth glistening surface. Obliterated pulmonary vessels, closed bronchi, cicatrices, and parenchyma infiltrated with plastic materials, are hardly to be distinguished from each other; and the whole adheres firmly, by means of the thickened semi-cartilaginous pleura, to the sunken walls of the chest. A few cretaceous tubercles are still found scattered throughout the hard, nearly homogeneous mass, which, below, merges sometimes gradually, but more often suddenly, into the healthy texture.

151. *d.* The deposition of *black pigment* into the lungs during the healing process is a very remarkable fact. It is found wanting only, or almost wanting, in the rare instances of the repair of tubercular disease by means of calcareous deposits in youthful subjects. In older persons the black pigment is so constant, and so considerable, that it might be doubtful whether it be the cause, or the sequel, of the cure of phthisis. "Not alone the parts closely adjoining calcareous tubercles and cicatrized cavities, but, in like manner, the entire mass of those extensive indurations of the upper lobe, just described, are found densely loaded with this pigment. Even the moist chalk-like residue of tubercular masses is often so imbued, as to exhibit a slate-gray or a bluish-black tinge." In other cases, where tubercles are more limited, and in young persons, the pulmonary structure is puckered, without induration or extensive obliteration; the cicatrices appearing elongated, the cretaceous residue as isolated granules, and the black pigment uniformly but less densely disseminated in the interstices of the air-cells. The cicatrices are surrounded by emphysema and dilated bronchi, and the thorax is seldom found depressed.

[That pulmonary tuberculosis is often arrested, is now admitted by all pathologists. Dr. BENNETT thinks that this happens in the proportion of from one fourth to one third of all who die after the age of forty. Observations made at the Salpetrière and Bicêtre Hospitals in Paris, among individuals generally above the age of seventy, showed the proportion in such persons to be respectively one half and four fifths.

The arrestment of tubercular ulceration may take place by the gradual transformation of the exudation into cretaceous and calcareous concretions; by expectoration and absorption of the exudation, the collapse of the ulcerated walls, and formation of a cicatrix; or, lastly, by the ulcerated walls becoming covered with a smooth membrane, remaining open, and constituting chronic cavities, which have occasionally been mistaken for dilated bronchi. All these modes of arrestment may be detected in the same lung, thus causing great diversities of appearance in the pulmonary texture. Increased density of the pulmonary tissue, in the neighbourhood of the cretaceous concretions and cicatrices, is often occasioned by black carbonaceous deposits, and this density and contraction is a frequent cause of pulmonary emphysema in the air-vesicles, as shown by Dr. GAIRDNER. This result leads to dyspnœa, so often observed after the removal of pulmonary tubercle. Whether the occurrence of emphysema, in such cases, exerts any curative power, as suggested by RAMADGE, is by no means established. The most important fact yet known in regard to the disease is, that, if we can check farther tubercular exudation, and keep up the strength and nutritive processes of the economy, such tubercular exudations as have occurred will be rendered abortive, and even large ulcerations will heal and cicatrize.]

152. *H. In children* the lungs are less the predominant seat of tubercles than other parts, especially the mesenteric and lymphatic glands and the bones. When deposited in the former in excess the tubercles pass through their stages rapidly. In very young children the pulmonary deposits are often latent, death ensuing from the coexistence or supervention of disease of other parts. In those subjects who have died of other maladies, the lungs contain grayish, transparent, semi-fluid granules or tubercles, not confined to the apex, but existing equally in the lower lobes. The bronchial glands are at the same time very tuberculous. BILLARD met with five instances of tubercles of the lungs in new-born children; HUSSON and KENNEDY in the fœtus. I have seen the disease in the lungs of several infants of the age of a few months only. The disease in young children is generally acute, and it usually is of this form up to the age of seven or eight years. In young children the tubercular deposits may be as great or even greater in the bronchial, mesenteric, and cervical glands; in the liver, spleen, brain and its membranes, and kidneys, as in the lungs.

153. *I.* The tubercular and other lesions, found in the several organs of *adults* dead of phthisis, are often very numerous. Many of them have been already described when noticing the *complications* and intercurrent affections of the disease. In the advanced stages, pleural inflammations occur, productive of every variety of false membrane, of adhesions, of miliary tubercles upon the pleura and within the exudations on its surface, and of turbid, reddish, serous, or purulent effusion. When the trachea and larynx are affected, as described above (§ 109), as well as in many other cases, the bronchial glands of the neck and those seated along the trachea are similarly affected, and exhibit all the phases of tubercular disease. The heart is quite devoid of fat in most cases. GLUGE states that he always found the blood within the larger veins and the heart in phthisis to contain pus-globules, to which circumstance much of the constitutional symptoms may be referred. LOUIS and BIZOT have remarked that the aorta is always more or less contracted. The alterations of the liver and alimentary canal are always remarkable, and described above (§ 114–118). From the searches of LOUIS, MOHR, and HASSE, it would appear that tubercles exist in other organs besides the lungs in the pulmonary phthisis of adults in the following ratio: The

bronchial glands were tuberculous in about one fourth the cases; the mucous membrane of the trachea and larynx in one twentieth only; the cervical glands in the same proportion; the intestinal canal in one half the cases; the mesenteric glands in more than one third; the mucous membrane of the stomach very rarely; the serous membranes very often, and in the following order of frequency: pleura, peritoneum, arachnoid, pericardium. The liver, spleen, urinary organs, brain, spinal cord, are occasionally implicated. The testicles, and the mucous surface of the Fallopian tubes are also sometimes affected. With the exception of the brain and the heart, the absolute density and weight of most organs, more particularly of the lungs, liver, and spleen, are augmented in tubercular phthisis. It therefore follows that the enormous loss in weight sustained by the body, amounting, on an average, to about 50 lbs., is due to the loss of adipose substance.

154. IV. Tuberculosis of the Bronchial Glands.—*Bronchial Glandular Phthisis.*—The bronchial glands may become tuberculated, either *primarily* or *consecutively*, of similar deposits in the lungs. It is chiefly to the *primary form* of tuberculated bronchial glands that attention is now to be offered. This is almost exclusively *a disease of childhood*. In this primary form, originating in adult or advanced age, bronchial glandular phthisis is comparatively rare; and in the aged it is almost always the mere attendant of lingering pulmonary phthisis. Primary tuberculosis of the bronchial glands generally commences between the first and second dentition, and finishes its course with the appearance of puberty, although its consequences are sometimes manifest beyond this period. It is obvious that this form of the disease may be associated with tuberculosis of the lungs and of other organs. It may, however, and often does, run its course without any tubercles being deposited in the lungs; or the lungs may become implicated at any period of the glandular malady, and be disorganized with the glands; or, lastly, bronchial glandular phthisis may subside.

155. The course of bronchial glandular phthisis is generally chronic; and the destruction and shrivelling of the affected glands proceed so gradually as to allow the organism time to compensate for the loss. "Hence it readily admits of reparation; nor is it in itself perilous, although accidental circumstances may render it fatal."—Hasse, page 349. The glands at the bifurcation of the bronchi are earliest attacked, and first pass through the several morbid stages. Thence the morbid process generally diverges into three distinct directions: first, to the lymphatic glands following the ramifications of the bronchi into the pulmonary structure; secondly, to those placed between the pericardium and the lungs, and along the œsophagus in the posterior mediastinum; and, thirdly, to those which accompany the large vessels in the anterior mediastinum, and pass from thence to the trachea and the cervical plexus. Only where tubercles are primarily seated in the mesenteric glands do they appear to advance to those glands which follow the course of the œsophagus, passing thence to the cervical plexus. In some instances they probably originate in the glands of the neck.

156. An occasion seldom offers of examining tubercles, in these situations, in their nascent states. In these states they then appear as gray or yellow granules, up to the size of millet-seeds. In a short time the glands become so infiltrated with tubercles as to form a yellowish-white friable substance, in which no vestige of the former healthy texture is discernible. They thus enlarge remarkably, those at the bifurcation of the trachea often attaining the size of a pigeon's egg, those within the lung that of a hazel-nut, their size decreasing with their remoteness from the part first affected. Though but loosely attached in the midst of cellular tissue in the healthy state, they now coalesce by its medium with the adjoining parts, especially with the bronchi, acquiring from the lardaceously condensed cellular tissue a firm isolating envelope.—Hasse.

157. These glandular enlargements but seldom produce very marked symptoms of compression of nerves or blood-vessels, although important trunks and branches run in their vicinity; but it is not improbable that the little attention hitherto paid to the lesions of the bronchial glands in children has led to the misinterpretation of the symptoms and effects produced by them, and to the disorders actually caused by them being imputed to other sources. It is extremely probable that *spasmodic croup* (see *art.* Croup, § 13, 14), *Laryngismus stridulus*, and other affections of the *trachea* and *bronchi*, are either caused, or aggravated, or perpetuated, by tubercular enlargements of these glands, although nervous filaments and arteries are found, on careful dissection, traversing the localities of, and obviously pressed by, these glands. The veins, however, are more susceptible of pressure by them; but the bronchial canals are seldom much affected by them, owing to the resistance furnished by their cartilaginous rings, and to the more yielding structures adjoining. In some cases, notwithstanding, as shown by Andral, the pressure has acted injuriously on the bronchi; and it may, even in adults, be connected with the pathology of some cases of *asthma*.

158. The tuberculous deposit in the bronchial glands may long continue without much change; but more frequently it undergoes softening. Hasse states that, when the softening proceeds from the centre, one or more small excavations are found containing a purulent and gritty matter, and the process is tedious. When the softening commences at the circumference, the filamentous sheaths of the glands are highly vascular and puffy, constituting at last a mere cyst around the thick, yellowish, tuberculo-purulent fluid. From this period the tumour collapses, its contents either becoming gradually absorbed, or escaping through a passage made by them. Absorption proceeds very slowly, being carried on chiefly by the external vascular coat of the tumour, the inside of which coat has a red velvety appearance. Like a vomica, it generally possesses an unorganized membraneous lining, formed of thickened pus and tubercle. The cavity thus produced does not, however, like the pulmonary excavation, continue to enlarge: its walls receive no additional deposition of tubercle, but rather protect from this occurrence; and in no case do two adjacent glands communicate or form one cavity. On the contrary, as the fluid contents are absorbed, the cyst contracts upon the more consistent residue, which, lessening gradually, acquires a cretaceous character, and ultimately is converted into a hard concretion. These products are often met with,

even in youthful persons, in the place of one or other of the bronchial glands, especially at the bifurcation of the trachea.—Becker.

159. "When the tuberculous mass has remained fluid until long after puberty, or the disease has arisen at a later period, black pigment becomes deposited, both in the unsoftened portion and in the pap-like matter." It is so intimately combined with the latter as ultimately to form a uniform, black, smeary pulp. In such cases, the tumour, while gradually contracting in dimensions, retains the same soft condition for years. Sometimes separate calcareous nuclei are found in the midst of the blackened mass. "This deposition of pigment within glands, totally degenerate and partially destroyed, is the more remarkable as furnishing a proof of connexion with the lymphatic vessels. It can scarcely be reckoned an immediate secretion from the glandular cyst, and *necessarily* concerned with tubercular cicatrization, because this process in other organs (the lungs excepted), and especially in lymphatic glands, is scarcely attended by any deposition of black pigment."—Hasse.

160. Softened tubercle often escapes by perforating the bronchi, generally from without inward, the tuberculo-purulent fluid bursting through the bronchus. Years are in such a case required for perfect recovery, which is brought about either by the gradual healing of the aperture, while the subjacent gland shrivels away, or by the closing of it ere the contents of the gland are entirely voided, the remainder afterward passing through the several phases, until it undergoes the calcareous change. Sometimes the irritation is renewed at a subsequent period, and the concretions come away.

161. Various other consecutive lesions supervene contingently upon those now mentioned; but these are individually of so rare occurrence as hardly to deserve enumeration. The chief of these are, 1st, the escape of the tuberculated contents of a bronchial gland into the parenchyma of the lung; 2d, perforation into the pleural cavity, where the softened glandular mass is situated immediately under the pleura, at the interlobular divisions (Berton, Rilliet, and Barthez); 3d, perforation of the œsophagus (Berton and Lablond); 4th, simultaneous perforation both of the œsophagus of the trachea and of the pericardium (Syme); and, 5th, perforation of the parietes of one of the large blood-vessels. Of each of these only two or three instances have been recorded.

162. In *children*, in whom alone this disease appears primarily or independently, the lymphatic glands of other parts, especially of the mesentery, often afford the sole evidence of concurrent disease. The lungs are, in particular, sometimes quite free from tubercles. Papavoine states that, of forty-nine children affected with tubercles of the bronchial glands, but thirty-eight had tubercles in the lungs. Rilliet and Barthez never found other organs in children tuberculous without the bronchial glands being pre-eminently so. Still, bronchial glandular pthisis in children often induces acute tubercular disease, the lungs, the liver, the spleen, the kidneys, the serous membranes, &c., being all found, in various degrees and frequency, to contain recent tubercles. In *adults*, on the contrary, in whom either recent, or the remains of former, bronchial glandular phthisis may be discovered, tubercular disease of the lungs always predominates, and is in itself fatal.—Hasse.

[The usual physical signs of this form of tuberculosis are, feeble respiratory murmur on one side, from pressure of one or more swollen glands on the bronchial tubes, dulness on percussion in the interscapular regions, bronchial respiration, mucous râles, and perhaps gurgling. If the rational signs of phthisis, as persistent cough, emaciation, &c., are present, while the physical signs are absent, over the chest, except at the parts above named, we may venture to pronounce the disease to be bronchial phthisis.]

163. V. Duration of tubercular Consumption.—It is not improbable that tubercles may exist in the lungs of a person hereditarily or constitutionally predisposed to phthisis, from an early age, in a quiescent state, or without advancing to the stage of softening, without shortening by many years the duration of life. This is more likely to occur when the determining causes of the disease have either been avoided or have not acted with much intensity. Instances have come under my own observation that have been characterized by the chief symptoms of the first stage, and by occasional attacks of hæmoptysis, from an early period of life, and yet they reached to upward of 60, and in two cases to 68 and 69 years. I have no recollection of an instance of 70 having been passed in such circumstances; but Dr. Gregory mentions a case of a person who was consumptive from 18, and died of the disease at 72 years of age. Phthisis, with the few exceptions arising from the occurrence of acute states of the disease, is essentially chronic or protracted. In general its duration is much shorter in hospitals, and wards containing a number of cases of the disease, and in crowded workshops and manufactories, &c. In 215 fatal cases at the Hospital for Consumption, in 193 cases observed by Louis, and in 200 noted by Bayle, the duration was as follows:

Duration.	*Hospital.*	*Louis.*	*Bayle.*
Less than a month.....	..	1	1
In one month	..	3	1
From 1 to 3 months...	1	11	14
" 3 to 6 months...	22	52	44
" 6 to 12 months...	66	62	64
" 12 to 18 months...	34	24	30
" 18 to 24 months...	22	17	18
" 2 years to 3 years..	29		
" 3 years to 4 years..	13		
" 4 years upward....	14		
" 2 years to 8 years..	..	23	18
" 8 years to 20 years.	..	..	10
Doubtful	14		

Although tubercles in an early stage may long remain latent or quiescent, yet when they begin to soften, there is every reason to suppose that their advancement is progressive, although at varying rates, or even so slow as to be nearly stationary. It is manifest that numerous circumstances after the commencement of phthisis must tend to accelerate its progress on the one hand, or to retard or arrest its course on the other. The continued or occasional operation of any of the causes of the malady—seasons, weather, climate, age, sex, constitution of the patient, medical treatment, diet, and regimen, may operate in either way. In the Hospital for Consumption it was observed that of those who died within 18 months 60.5 per cent. were males, but only 50 per cent.

were females; while of those who lived beyond eighteen months, 31.9 per cent. were males, but 45.5 per cent. were females. According to the tables of Louis and Bayle, the duration of the disease was twenty-three months, which nearly agrees with M. Andral's experience at La Charité. Sir J. Clark remarks that in the upper ranks of society, where patients have all the advantages of the best regimen, of change of air, and of medical treatment, the average duration of phthisis is probably not much short of three years.

164. VI. The Prognosis of Phthisis.—The result in most of the cases of consumption will become apparent from what has been already adduced.—*A*. The slower the pulse, and the less acceleration remarked in it by change of posture, cough, and mental excitement, the more favourable may be the opinion formed of the duration, if not of the ultimate issue, of the disease. The absence of the flocculent and puriform characters of the sputa in the advanced stages, and of the symptoms and signs of pneumonia, pulmonary congestion, pleurisy, &c.; an increase of flesh, strength, and weight, or even the arrest of progressive emaciation; the non-appearance of night or morning sweats or diarrhœa; the respiration remaining only moderately accelerated, or not being accelerated in a much greater ratio than the pulse; the absence of marked anæmia, emaciation, and debility, and of the other complications besides those just mentioned; the persistence of accustomed discharges, and the continuance in females of the catamenia in the natural or accustomed state; the tolerably regular discharge of the several secreting and excreting functions, especially those of the bowels; quiet repose during night; a mild form of the hectic fever, and an improvement in one or more of the chief symptoms and signs of the malady, may severally or all be viewed as indications of a slow or protracted, if not a curable state of the disease.

165. *B*. Much *less favourable*, and indeed most commonly *unfavourable*, are the following: Rapidity, softness, and smallness of the pulse, or a pulse ranging about or above 110 in the adult; quickness of respiration above the ratio which the respiration bears in frequency to the pulse; the states of the sputum indicating the second or third stages of the disease; the appearance of aphthæ on the tongue or mouth, or the symptoms or signs of any of the chief complications described above (§ 104, *et seq.*); the occurrence of profuse sweats or diarrhœa, without any obvious cause; inability to lie on either side; great emaciation, or the production of bed-sores; manifest anæmia conjoined with great rapidity and smallness of pulse; great dyspnœa and oppression throughout the thorax; suppression of accustomed or natural discharges or evacuations; a clubbed and fusiform state of the fingers, and incurvation of the nails; loss of the hair, with profuse perspiration from the scalp, neck, and chest; pain and constriction extending between the sternum and spine; the occurrence of a wandering delirium during the febrile exacerbation of the evening and night; and the loss of appetite for food, are the chief indications of a progressively fatal state of the disease.

166. The hæmoptysis so frequently indicating the commencement and progress of phthisis, as well as being an important complication, may, according to its character and amount, be either a favourable or unfavourable occurrence. If it be an early or incipient occurrence, the pulse being neither very frequent nor small; if the pulse fall in frequency, and if oppression in the chest and difficulty of breathing be diminished by it; if it be of a moderate amount, or even if it be very abundant, and be followed by an amelioration of the symptoms, it may prove even beneficial, by removing pulmonary congestion and incipient inflammatory action, although the presence of a portion of the blood in some of the bronchi may excite inflammatory irritation of their mucous surface. When, however, the hæmoptysis is very scanty, or merely streaks the expectoration, or if it be brownish, rusty, or black, and at the same time scanty or very moderate, it then may be viewed as an unfavourable circumstance, or as indicative of active congestion, or of congestive pneumonia of a portion of lung; if it be abundant, protracted, and the blood very dark and gelatinous, no relief of the oppression and dyspnœa following it; and if, in either case, the pulse becomes even more frequent and the respiration more rapid, the danger is great. In a case of this last description, which I saw a few years ago at Lowestoft with Mr. Worthington, an arrest of the hæmorrhage was procured by means of the oil of turpentine, and the recovery became complete under the treatment advised in the sequel. Hæmoptysis at an advanced period of the disease, more especially when cavities are formed in the lungs and the loss of blood large, is always an alarming symptom. The same opinion should be formed if the expectoration be a sanious, ichorous, or offensive character, or if it contain shreds or small pieces or patches of disorganized substance or tissue.

167. The existence of cavities, although clearly indicated by all the usual physical signs, is not a sufficient reason for viewing the disease beyond amelioration or even cure, if the pulse and respiration be not greatly accelerated, and the other symptoms be not unfavourable, and especially if the flesh and strength of the patient be not very much reduced; for one or even more cavities may exist in the lungs, and still sufficient healthy structure may remain to perform the functions of respiration, provided that these functions be not too heavily taxed, and that the remaining lungs be not the seat of inflammatory action or congestion, or of tubercular deposit. The falling in and immobility of the parietes of the chest, with great acceleration of the respiration and pulse, difficult respiration, sweats, diarrhœa, and aphthæ are in such cases the indications of a not far remote dissolution. If the patient, not having retrograded during winter or spring, experiences an aggravation of all the symptoms upon the sudden occurrence of warm or hot weather, it may be inferred that no amelioration can be expected; for I have observed that patients thus affected by the transition to a range of temperature of about 70° or upward, generally do not survive above a very few months; and that those who are improperly sent to a warm climate at an advanced stage, soon have their existence terminated by the injudicious change.

168. VII. The Causes of tubercular Phthisis may be supposed to be fully ascertained, and their influence in producing the prevalent and fatal malady duly estimated, individually and concurrently, by the numerous writers who have treated of its forms and symptoms; yet have these causes been often imperfectly ascertained,

or incorrectly imputed, in respect of certain states of the disease, and their sources, nature, and co-operation very insufficiently investigated. Hereditary predisposition is fully admitted, but the other remote or predisposing causes, which appertain especially to the parent or parents, and influence the organization of the offspring, are insufficiently recognised. The predisposition, also, which is generated, and the more direct effects produced in the frame by the causes which depress the vital influence—whether mental or physical—whether morally or corporeally exhausting, in circumstances peculiar to the individual, by the removal of agents to which the frame has become habituated, or which are necessary to health, and by the action of other agencies, which are either obscure or concealed, or are merely concurrent in their operations with more prominent or commonly admitted causes, are often overlooked or not known; and thus the advantages connected with their prevention and removal are altogether lost. Hence, these *causes* being unknown or unsuspected, their *effects* cannot be prevented; and the means necessary to the removal of the former or the cure of the latter are either altogether neglected, or employed accidentally, empirically, and often inappropriately.

[If the mortality produced by pulmonary phthisis is ever to be lessened in any great degree, it will doubtless be effected by *preventive measures*. These means, when known and appreciated by the community, will be adopted to a greater or less extent, and by their adoption a vast amount of human suffering and human life will be saved. The causes of this disease, as stated by our author, have never been accurately ascertained, for the want of an extensive series of systematic, uniform, and exact observations of the external circumstances, atmospheric, local, and personal, occurring in each case. We would respectfully suggest to the *Am. Med. Association* the expediency of making a united and energetic effort, throughout every state in the Union, to obtain such observations, as well as the annual mortality from the disease in every state, with a view to arrive at a more accurate knowledge of its predisposing and exciting causes. To this end, a form of a uniform register of cases, embracing all questions calculated to throw any light upon the causation of the disease, should be prepared and placed in the hands of every qualified physician in the United States, and the results which would thus be accumulated in the course of a few years would undoubtedly lead to discoveries of the highest importance. For example, 3000 cases of tubercular consumption annually occur in the single state of Massachusetts, and an equal proportion in all the New England States. Suppose we had an accurate history of all the circumstances attending each of these cases reduced to a tabular form, and easy of consultation, can any one doubt that we should be better prepared to adopt preventive measures in regard to the disease!]

169. When treating of Scrofula and Tubercles (§ 13, *et seq.*), the *causes of these generic states of the disease* were then fully described; but the *causes* which, whether acting singly or in combination, develop *this species of malady* require attention, more particularly with reference to their modes of action. Certain of these causes, however, which have been fully considered in the article now referred to, will hardly be noticed, or noticed only with reference to this specific disease; while others will receive that attention which their importance demands, with due regard not merely of the *causation*, but also of the prevention of this malady.*

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* CLASSIFICATION OF THE CAUSES OF TUBERCULAR CONSUMPTION.

i. The Causes appertaining to one or both Parents.
- A. *Hereditary Constitution, or Predisposition.*
  - *a.* Transmission to the fœtus, or infant.
  - *b.* Extent of hereditary transmission.
- B. *Diseases of the Parents productive of tubercular Consumption.*
  - *a.* A syphilitic cachexia.
  - *b.* A constitution impaired by mercurial courses.
  - *c.* Exhaustion of vital power, or debility caused by excessive sexual indulgences, or by masturbation.
  - *d.* A gouty diathesis.
- C. *The Ages and the Social Condition of the Parents.*
  - *a.* Premature congress in respect of either parent.
  - *b.* Far-advanced age, especially of the male parent.
  - *c.* Influences of circumcision or uncircumcision.
  - *d.* Intermarriages.
  - *e.* The occupation of the parents.
- D. *The Modes of Living of the Parents in respect of Food and Drinks.*
  - *a.* Insufficient or unwholesome food—pork, bacon, &c.; blood and viscera of animals, &c.
  - *b.* A vegetable and animal diet considered; fish, &c.
  - *c.* Intemperance, and addiction to spirits—in the male, in the female.
  - *d.* Causes acting on the female during gestation and lactation.

ii. Causes acting chiefly during early Life, or previously to Puberty.
- A. *Inappropriate Food, Drink, and Regimen of Infants and Children.*
  - *a.* During infancy. The milk of strumous or phthisical nurses.
  - *b.* Insufficient or unwholesome food in childhood.
  - *c.* Sleeping with the aged, debilitated, or phthisical.
- B. *Contaminated, cold, and humid States of the Air.*
  - *a.* Overcrowding, congregating, or sleeping in great numbers, in a close apartment, &c.
  - *b.* Exhalations from privies, cesspools, drains, or from swamps, &c. (ical.
  - *c.* Emanations from the lungs and skin of the phthis-
- C. *Employments, Exercises, Amusements, and Regimen, previously to Puberty.*
  - *a.* Sedentary employments, irksome occupations, &c.
  - *b.* Deprivation of out-door exercises and amusements.
  - *c.* The congregation of numbers in factories, rooms, houses, and sleeping apartments.
  - *d.* Dress, day and night clothing.
  - *e.* The influence of light, sunshine, and temperature, especially the deprivation of these.
  - *f.* The influence of low temperature, humidity, and exhalations, &c., during sleep; sleeping apartments, &c.

iii. Causes most frequently acting during and subsequently to Puberty.
- A. *Amusements, Exercises, Occupations, Clothing.*
  - *a.* Studies, amusements, and exercises, in both sexes.
  - *b.* Positions of the trunk of the body, supports, stays.
  - *c.* Clothing in respect of the several regions of the body.
- B. *Trades, Employments, and Conditions of Life.*
  - *a.* Trades which are injurious by preventing exercise in the open air.
  - *b.* Occupations in which dust, or other irritating matters are inhaled—grinders, sculptors, &c.
  - *c.* Occupations which are exposed to great vicissitudes of temperature and weather.
- C. *The instinctive Desires and Emotions.*
  - *a.* Premature or excessive sexual indulgence.
  - *b.* The vice of masturbation.
  - *c.* Celibacy.
- D. *Mental Exertions and Affections.*
  - *a.* Intense or prolonged mental exertion.
  - *b.* The depressing mental emotions and affections.
  - *c.* Nostalgia.
  - *d.* Prolonged anxiety. Disappointed hopes and affections.

iv. Causes consisting of contingent or associated Influences or Circumstances.
- A. *Sex, Age, Diathesis, and Temperament.*
  - *a.* Sex, age, &c.

170. i. The Causes appertaining to one or both Parents.—*A. The hereditary transmission of phthisis* is proved, 1st. By the frequency of the disease in the offspring of parents of a scrofulous diathesis or taint, whether quiescent or manifested by internal or external tuberculosis; 2d. By the presence of tubercles in the fœtus, and in infants of tuberculous, phthisical, or scrofulous parents; 3d. By the existence of tubercular consumption in the offspring of a scrofulous mother or scrofulous father, and the scrofulous parent having died, the children of a parent of a sound constitution, in cases of a second marriage, having been exempt; 4th. By the occurrence of the malady in a family in which no other cause exists; 5th. By the hereditary transmission of the disease in the lower animals. Delafond states that a phthisical ram produced the disease in from sixteen to twenty sheep.

171. Phthisis may be transmitted to the offspring: 1st. As a predisposition, or proclivity, or diathesis, or taint—terms which are nearly synonymous; 2d. As a latent germ, which may be quiescent for many months or years; 3d. In a more or less developed state in the fœtus. The scrofulous taint of the parent, although quiescent, may give rise either to external scrofula or to internal tuberculosis in the lungs, or in some other organ, or in several organs or tissues, especially in children and young subjects. External scrofula, or external glands which have fully suppurated, is less likely to be followed by phthisis than the quiescent scrofulous taint; but either condition will transmit phthisis to the offspring. The transmission may not take place in the children, and yet appear in the grandchildren. The predisposition, arising either from the scrofulous taint or from declared tubercular disease of some organ or tissue, may remain dormant through life, not having been roused by the exciting and determining causes into activity, or developed in the form either of glandular enlargement, &c., or of tubercular consumption, so that it cannot be inferred that the offspring of a scrofulous or phthisical parent or parents, who has not been affected with either scrofula or phthisis is, therefore, free from the constitutional taint, or, in other words, from the hereditary predisposition. It is manifest, however, and it will appear still more manifest hereafter, that a very varying proportion of those attacked with phthisis in any community or climate shall have been thus afflicted from hereditary predisposition, numerous other predisposing and exciting causes being sufficient to develop the malady in those not hereditarily or even constitutionally liable to the malady.

172. *a.* As to the proportion of cases of phthisis that may be referred to hereditary taint, authors differ widely. Ruysch says that four fifths are hereditary; M. Portal, two thirds; Mr. Ancell, one third; M. Piorry, one fourth; Briquet, 36 out of 90; Rufz, 24 out of 35. Mr. Ancell states that in the Consumptive Hospital 24½ per cent. of consumptive patients were born of phthisical parents. M. Roche considers that the children of phthisical parents are doomed to the disease, and such may be the case if they be subjected to one or more of the causes which occur previously to, or during puberty and early manhood. M. Lugol states that more than half the subjects of tuberculosis have consumptive progenitors. Of 141 persons affected with scrofulous glands, whose family history was investigated by Dr. Balman, the following accounts were furnished:

The *Fathers* died of phthisis in	9
One or more deaths occurred from phthisis in the families of uncles and aunts on the father's side of	61
Grandfathers on the father's side died of phthisis	11
Grandmothers on this side	17
	98
The *Mothers* died of phthisis of	11
One or more deaths from phthisis in the families of uncles and aunts on the mother's side of	38
Grandfathers on this side died of phthisis	9
Grandmothers	20
	78

173. In 30 of the 141 scrofulous persons, no death from phthisis in either parents or collateral relations were ascertained; but whether the latter exhibited signs of tuberculous taint or disease does not appear. In the Hospital for Consumption, of 669 *males*, 122, or 18.2 per cent.; and of 341 *females*, 124, or 36.3 per cent., were predisposed by the disease having existed in a parent or parents.

174. *b. As to the relative frequency of the transmission of phthisis in the two sexes* opinions are opposite, and statistical information is very imperfect. J. P. Frank, J. Frank, M. Briquet, Richard, and Phillips, favour the more frequent transmission by the father, while Hasse and others entertain an opposite opinion. From the report of the Hospital for Consumption it would appear that, omitting those cases in which both parents were consumptive, the father transmitted

b. Diathesis and temperament.
B. *Seasons and Atmospheric Conditions.*
a. Humidity, dryness, temperature, and other atmospheric conditions.
b. The seasons—winter, spring, summer, and autumn.
C. *Climate and Locality.*
a. Climate and locality of various countries.
b. Climate in connexion with modes of living.
c. Climate in connexion with religious and social observances.
d. Prevalence in England, London, &c.
D. *Influence of Confinement in Prisons, Workhouses, and of Expatriation.*
a. Prisons, hulks, &c.
b. Workhouses, &c.
c. Expatriation, &c.
E. *Vicissitudes of Fortune*, &c.
a. Poverty and distress.
b. Loss of reputation, of friends, &c.
v. Pathological Causes of Phthisis.
A. *Previous Diseases of the respiratory and circulating Organs.*
a. Catarrh, catarrhal fever, influenza.
b. Bronchitis, pneumonia, broncho-pneumonia.
c. Hooping-cough.
d. Vascular lesions of the heart, with or without hæmoptysis.
B. *Exanthematous Diseases.*
a. Vaccination, small-pox, &c.
b. Measles, scarlet-fever, &c.
C. *Suppressed or excessive Secretion and Excretion.*
a. Suppression of the cutaneous excretions.
b. Excessive secretion or excretion—prolonged suckling.
c. Disordered, suppressed, or excessive catamenia.
D. *State of organic, nervous, or vital Power.*
a. Hereditary debility.
b. Acquired debility.
E. *Morbid State of the Blood.*
a. Anæmia.
b. Chlorosis.
c. State of the hæmato globulin.

the disease to sons in 59.4 per cent., and to daughters in 43.5 per cent.; and that the mother transmitted the malady to daughters in 56.5 per cent., and to sons in 40.6 per cent. The numbers from which the above results are calculated are, however, insufficient to be relied upon; nor can the facts be determined with precision, especially as respects the absence of any taint in either parent. In a few cases in which I observed with care the constitution of both parents, the taint existing only in one parent, was communicated in very nearly an equal ratio to both sexes of the offspring.

175. *c.* The question may be asked, *In what manner or way is the hereditary predisposition transmitted?* Is it by the general organization or constitutional formation, or by the blood, or by miliary germs? But previously to the consideration of this topic, it may be asked, Is the tubercular taint, either quiescent or manifested by internal or external tuberculosis, necessarily transmitted from parent to offspring? That it is thus transmitted when both parents are predisposed or tainted, cannot be doubted. The taint may be latent, not having been developed into active disease owing to the inefficiency of the exciting causes. When, however, one parent only is thus tainted, all, or only some, or even none, of the offspring may be predisposed, the taint being limited to one or more, or extended, in various grades, to several or to all. That the constitutional taint may exist in the offspring in the form of *miliary germs* is possible, inasmuch as several observers as well as myself have detected these germs in the fœtus where the taint has been manifested in either or in both parents; but this cannot therefore be considered as the usual manner in which the evil is transmitted. It has been supposed to be always conveyed in the blood—the taint existing in the blood of the fœtus and of the individual into which the fœtus is developed in all the stages of growth and existence. This supposition may be correct, but various considerations militate against it. 1st. There is no proof, either chemical or microscopic, of the fact. 2d. The predisposition or taint being permanent, it cannot be inferred as always existing in the blood, which is continually undergoing changes by the functions of secretion, nutrition, and excretion—by the processes of assimilation and of waste—by the metamorphosis of the globules from the states of those existing in the chyle, through those forming the red blood, to their final extinction by the secreting and excreting organs. 3d. If it exist in the blood, it must necessarily vary with the changes and constitution of the blood, or even be eliminated from the blood, during the processes just referred to, or by the agents often passing into and affecting the circulation, or in the course of diseases which sensibly alter the states of the blood; but no diminution or alteration of this taint has ever been produced in consequence of any or of all these agencies. That this predisposition or taint is one not existing primarily in the fluids, although more or less manifestly affecting these fluids, both the circulating and the secreted, may therefore be inferred; and that it is present in those parts of the solids upon which digestion, assimilation, and nutrition mainly depend, must necessarily appear as a rational conclusion—that it is as much a part of the constitutional conformation—of the intimate organization of the tissues and organs, as of the conditions and contour of the several parts and features of the individual, and of the states of intellectual and moral development and power.

176. *B. The disorders of the parents predisposing to tubercular consumption in the offspring* are chiefly the scrofulous taint; the syphilitic cachexia; a constitution impaired by mercurial courses, or by excessive doses of mercury; exhaustion of vital power, or the debility caused by age, sickness, excessive sexual indulgences, or by masturbation; and a gouty diathesis. Certain of these have been fully discussed when treating of Scrofula and Tubercles (§ 23, *et seq.*); and the dependence of phthisis upon the scrofulous taint fully insisted upon, as regards a very large proportion of the cases, both under that head and above (§ 170–175). Others of these sources of predisposition require merely a few remarks at this place. Excessive sexual indulgences, and more especially masturbation, particularly as regards the male parent, have a very marked influence upon the constitution of the offspring, if indeed any offspring be produced by persons thus exhausted. In most instances, the children of these parents are puny, very generally tuberculosed, the membranes of the brain, the substance of the lungs, and other organs being often the seats of the tubercular deposits to an extent incompatible with the duration of life for any number of years or even of months; or if the effects are not so severely and early manifested, a predisposition is at least communicated to the offspring to external scrofula, in childhood or about the period of puberty, or to pulmonary tubercles about the same epochs or at later ages.

177. *a. The ages and social conditions of the parents* are not without influence in favouring a predisposition to phthisis in the offspring. Among the most important of these are premature sexual congress, in respect of either or both parents, and far-advanced age, especially of the male parent. The effects upon the offspring are, in all respects, the same as those just enumerated; namely, a very early mortality from internal and external tuberculosis, and a predisposition to tubercular phthisis at early or advanced epochs of existence.

178. *b.* The influences of *circumcision* and of *uncircumsion*, the former as tending to prevent, the latter as favouring, a predisposition to the scrofulous taint, have hitherto been entirely overlooked; or if any attention, even the least, have ever been directed to the matter, it has certainly been by no means adequate to its importance, as respects the constitutional and mental powers of the offspring. The subject has hitherto been viewed entirely as a religious rite, altogether superseded by the doctrines of Christianity; but unjustly superseded by the earliest schismatics in the Christian Church—by some of the apostles themselves. Circumcision, however, as practised by the followers of Mohammed, is very different from that inculcated by Abraham. By the latter, the whole of the prepuce was directed to be extirpated at a period of life most proper for the operation; while the former resorted merely to an incision. The advantages of the Jewish rite are not merely those which have usually been imputed to it; namely, the prevention of the usual effects of the retention of the follicular secretion under the prepuce; but chiefly the prevention of that excitement to masturbation about the period of puberty, experienced by, and so frequent among, the uncircumcised, especially in warm countries; and

the more prolonged act of sexual congress, and the more complete as respects the female, than in persons otherwise circumstanced. The general results in connexion with other predisposing causes influencing the constitution of both parent and offspring, notwithstanding several powerful counteracting circumstances, are more prolific marriages, and the less frequent occurrence of the scrofulous, phthisical, and gouty constitutions, in the Jewish than in other races.*

179. *c. On intermarriages, or marrying in and in*, among particular races, families, and religious sects, &c. I have already offered some remarks, when treating of Scrofula and Tubercles (§ 27), showing the unfavourable influence this cause exerts on the offspring. As to the *influence which the several professions and occupations of life followed by the parents* may exert on the health of the offspring, it is most difficult to arrive at a conclusion, as statistics can furnish no precise data. Whatever injurious effect may be produced is certainly manifested in the guise of tuberculosis, in one or other of its forms and seats. The only inference which can be drawn with justice from the professions and employments of the parents is, that such as are most conducive to the promotion of health and strength will be most likely to favour corresponding effects in their children.

180. *C. The modes of living of the parents as to food, drink, &c.*, have been too generally disregarded in our speculations on the causes of the disorders and diseases of childhood, and of the constitutional powers and predispositions of the offspring.—*a.* The injurious effects of insufficient and unwholesome food, and of the frequent use of pork and pork meats, and of the blood and viscera of animals—not only on the parent, but also on the offspring; and the respective influences of a vegetable and an animal diet, were considered when treating of Scrofula and Tubercles (§ 31, *et seq.*). To these topics I need not revert; but the use of fish, or a purely fish diet, including shell-fish, has not been satisfactorily investigated. In the Shetland Isles, where I resided up to the age of sixteen, and visited for short periods for several years afterward, the labouring classes live chiefly, or rather entirely, on fish, potatoes, meal, and cabbages—the kinds of fish being the most wholesome and best—the cod, ling, the torsk, halibut, haddock, whiting, skate, coal-fish, &c.; and these are very generally taken with the oil of the recent livers as the only sauce. Those who live in this manner are healthy, enduring, and but little subject to visceral disease. Shell-fish is more productive of cutaneous affections than the fish now mentioned; and the former is more frequently followed by other injurious effects, especially in persons of a peculiar idiosyncrasy. (See *art.* Poisons, § 428, *et seq.*)

181. *b.* There can be little doubt of *the injurious influence of the intemperance of the parents on their offspring*; and there is as little doubt that the injurious effects are mainly evinced by the scrofulous diathesis thereby generated in the children, and developed either into external and internal tuberculosis in infancy, or into tubercular consumption in early or late epochs of existence. It is difficult to say in what sex or parent this vice is most productive of these maladies in the offspring. It is, however, evident that the female who addicts herself to the abuse of intoxicating liquors, and especially during pregnancy and lactation—and there are many both in the middle and lower classes who thus devote themselves and their infants to perdition—will bear an unhealthy fœtus, or one which will be imbued with the diathesis and seeds of disease just mentioned; and, if it live so long, will communicate a similar evil to its offspring. How efficiently are our legislators providing the incentives to the destruction of health, constitution, and morals, in the licenses and encouragements furnished throughout the kingdom to the abuse of intoxicating liquors! But what are these important matters to the higher consideration, to them, of aristocratic interest, family patronage, and the influence of party?

[It has been maintained by some writers that the habitual use of alcoholic liquors serves as a prophylactic against attacks of tubercular phthisis. This may be so, and yet the lungs are very frequently the seat of *disease* in intemperate subjects. Of 73 intemperate persons who died suddenly, 42 by drowning, and the rest from accident or suicide, Dr. Ogston, of England, found abnormal appearances within the cranium in 65 cases (89 per cent.), and in the respiratory organs in 41 cases (56 per cent.); while in 41 per cent. there were marks of disease in the pericardium, heart, or aorta; in 27 per cent., in the stomach; 10 per cent. in the intestines; 41 per cent. in the liver; in the kidneys, 34 per cent.; abdomen, 73 per cent.; in the spleen, 14 cases: of course several organs were affected in the same individual. We have supposed that there was no exception to the general law that all causes which tend to lower the vital forces, or to derange the digestive organs, predispose, in the same degree, to tubercular disease. With regard to the action of alcohol, Liebig supposes that its elements combine with oxygen in the body—that its carbon and hydrogen are given off as carbonic acid and water—the oxygen existing in a free state in arterial blood. It is evident that if the power of the elements of alcohol to combine with oxygen were not greater than that of compounds formed by the change of matter, or that of the substance of the living tissues, they could not combine with oxygen in the body. Thus, by the use of alcohol, a limit must rapidly be put to the change of matter in certain parts of the body: the oxygen of the arterial blood, which, in the absence of alcohol, would have combined with the matter of the tissues, or with that formed by the metamorphosis of these tissues, now combines with the elements of alcohol, and *the arterial blood becomes venous* without the substance of the muscles having taken any share in the transformation. The amount of carbonic acid given off by the lungs,

* [We do not see clearly the connexion between the cause and the effect here pointed out by our author. That there is no nation more addicted to sexual indulgences than the Jews, we suppose will be generally admitted; and they have always borne this character. Polygamy was allowed "for the hardness of their hearts" (Mark, x., 5), notwithstanding circumcision. There is no evidence, moreover, that the Jews are less addicted to masturbation than other nations; and if they are less liable to scrofula than others, we would attribute the exemption rather to the prohibition of pork as an article of diet. Nor can we subscribe to the sentiment, that circumcision was "unjustly superseded by some of the apostles," by the rite of baptism, unless Christianity itself be regarded as an unjust innovation upon the Jewish religion, which no Christian, we suppose, will concede. The hygienic regulations of Moses, apart from circumcision, are well calculated to promote the general health, prevent the occurrence of "scrofulous, phthisical, and gouty" affections, and render marriage "prolific."—*Ed.*]

however, is diminished under the influence of alcohol, while the animal heat is somewhat lowered, and the general strength diminished, or, as Liebig says, "weariness, feebleness in the limbs, and drowsiness, plainly show that the force available for mechanical purposes, in other words, the change of matter, has been diminished." If Rokitansky's views in regard to the prophylactic power of venous blood against tubercular disease be well founded, it is possible that the use of alcoholic drinks may, in this manner, exert a similar prophylactic power. Observed facts would seem to lend countenance to such a belief. Thus, the late Dr. Swett, of New York, in his work on "Diseases of the Chest," p. 238, remarks, "Two medical gentlemen, attached to the public deadhouse in this city (New York), in which bodies are deposited which are found in the streets, or without friends, discovered, in about 70 post-mortem examinations of those who had died of the most confirmed and aggravated intemperance, not a single case of tuberculous lungs"—a most surprising result, when we remember that this unfortunate class have probably long suffered from poverty, bad nourishment, and exposure to the weather—influences which are regarded as predisposing to the tuberculous deposit. It should, however, have been stated that in a majority of these same cases there were signs of *disease* in the pulmonary organs, as pneumonitis, chronic catarrh, pleurisy, hydrothorax, &c., as well as in many other important organs, so that, as far as *longevity* is concerned, nothing is gained by the habitual use of alcoholic drinks. No fact is better established than that the average value of human life is vastly greater in those who entirely abstain from such stimulants in health. As a remedy for phthisis, we have no doubt that alcohol, like cod-liver oil, and other hydro-carbonaceous compounds, is often of great service as a calefacient and nutrient, and by preventing the too rapid disintegration and metamorphosis of the tissues.]

182. Other causes besides intemperance may so affect the mother during the child-bearing period of life, and during pregnancy and lactation, as to favour the development of a scrofulous and tubercular disease in the fœtus and infant. Too low living, unwholesome meats, especially the too exclusive use of pork and bacon, anxiety of mind, and all the distressing and perturbating emotions, are more or less injurious to the offspring, and in the way just stated, more especially when conjoined with the other causes of ill health, which abound in all cold, low, humid, and ill-drained localities; in crowded and ill-ventilated houses and apartments, and in crowded or close manufactories and manufacturing towns.

183. *c. The use of tobacco* in any way, either by smoking, snuffing, or chewing, is most injurious, especially in early life, and as respects its effects upon the constitution of the offspring, more particularly when either of these vices are indulged to excess by the male parent. Numerous instances have come before me of young men who have become habitual tobacco-smokers in early life, and who, having married, have either failed of having a progeny, or had children that could not be reared; or, if they reached any of the early epochs of life, were subjects of tuberculosis in one or other of its forms or seats, and especially of tubercular consumption. (See *art.* Poisons, 523, *et seq.*)

184. ii. The Causes of tubercular Consumption that act chiefly during Infancy, Childhood, and early Life, or previously to Puberty, have been so fully discussed under Scrofula and Tubercles (§ 30–64), that very little is left for me to add at this place. The reader will find the several agencies arranged under this class considered at the place now referred to. There are, however, a few topics thus arranged which require notice, as being of some importance in a prophylactic point of view.—*A. Sleeping with very old and debilitated persons* is certainly prejudicial to the healthy, both in predisposing to tubercular consumption, and determining or developing the disease in those predisposed by a scrofulous diathesis or other influences. It may also be associated with other causes, and the results become more immediate and severe.

185. *B. Infection.—Emanations from the lungs and skin of persons, in the second or third stages of phthisis especially*, are certainly sometimes productive of consumption, more particularly in young persons of a scrofulous diathesis, and in those who are predisposed by other causes, or who are subjected to several concurring influences. The inhalation by the healthy of the emanations from the lungs and skin of the consumptive, and the consequent appearance of the disease in the former, may, as in other cases of infection, be productive of its injurious effects only in the circumstances now stated, but the disease is caused by infection nevertheless, although the fact is stated loosely by many writers as one of the propagation of phthisis by contagion, and denied by others, as, indeed, the infectious nature of nearly every disease has been denied by some, who consider belief in infection to be credulity, and skepticism to be a proof of a "strong-minded" physician, or rather of an incredulous old woman. Although phthisis, in the circumstances favourable to infection, may be communicated to others, especially when the healthy sleep in the same bed or apartment with the sick, and although this result is, perhaps, more likely to occur in persons under or about the period of puberty than at a much more advanced age, yet for many years after puberty the person thus exposed and predisposed may be attacked; and this result is the more likely to take place in the cases of married, especially recently married, persons. I state this as the result of my observation; and, although the matter has been discussed from the days of Galen, and the occasional transmission of the disease by infection believed by him, by Riverius, Morton, Van Swieten, Narducci, Roncalli, Chavet, J. Frank, Hufeland, Hildenbrand, and many others, and denied by Salmade, Castallani, Portal, and numerous other writers, it still remains in dispute.*

186. *C. Employments, Exercises, Amusements, and Regimen previously to Puberty.*—Sedentary employments, irksome occupations, and confine-

* [Occasional facts have been observed, which seem to favour the doctrine of the contagiousness of tuberculosis, but they are rare, and perhaps were only coincidences. Lugol states that he had observed scrofula under all its forms for 25 years, and yet had been unable to detect a single case of contagion (*On Scrofulous Diseases.* N. Y., 1845, p. 246). We have met with several cases where the wife, from watching over and nursing a sick husband with phthisis, has gradually declined from the same disease; but then it is to be remembered that anxiety, loss of sleep, depraved appetite, want of exercise in the open air, &c., are powerful predisposing causes, and would probably lay the foundation of the disease, independent of contagion. We doubt, therefore, whether phthisis can ever be truly said to be contagious.—*Am. Ed.*]

ment in close or dark apartments, are more or less influential in predisposing to, or more directly occasioning, tubercular phthisis. The deprivation of out-door exercises and amusements, so requisite at this period of life to the development and strength of the constitution, and the congregation and confinement of numbers in ill-ventilated factories, houses, or sleeping-apartments, blight the vital endowments of the frame; and of all the structures and organs, the lungs, like the leaves of a plant—both being the respiratory organs of their respective bodies—are the first to experience, and the most disposed to sustain injury. Nor are dress, night and day clothing, the influence of light, sunshine, and temperature, at this period of life, undeserving attention as respects both sexes; for, although either of these singly may appear of little importance, yet operating, as they often do, in combination, their effects on the general organization are often remarkable. The frequent practice of leaving portions of the body uncovered by the dress, without reference to the weather and season, during the early periods of life the very low temperature of sleeping-apartments during the winter season, in this and some other countries, while the confinement of the air by closely-drawn curtains around the beds causes the repeated respiration and consequent contamination of the air, thereby inducing feverish, restless, and unrefreshing sleep, and a contaminated state of the blood, are among the most influential occasions of an imperfect development of the body at a period of life when all the aids to health and strength are most especially required. Not infrequently, also, other agencies are brought in co-operation with those just mentioned, and these too of no mean influence. Deprivation of light and sunshine—of the salutary influence of the sun's rays on the frame—not infrequently, especially when aided by the causes already noticed, produces an etiolation similar to that occasioned by this cause in plants; and, although the body grows in height, and the vessels extend in the direction of their axes, as in plants, yet the various structures are loosely, weakly, and insufficiently formed, each one being deficient in tone, firmness, and vital cohesion. Associated with this state of imperfect organization, the blood presents a similar defect of assimilation, and an arrested development of the red globules. It is thin, watery, and, although it may abound in colourless globules, or in those not yet metamorphosed into red globules, these last are very much diminished in number, or in their usual proportions. Nor should the mental depression, the irksomeness, the weariness of both body and mind, occasioned by the circumstances noticed under this category, and their effects upon the youthful constitution, be overlooked. These circumstances, when acting either singly, but protractedly, or in various combinations, exert their injurious influence primarily, although not always manifestly, on the lungs. These organs, although generally the first to suffer, are not always the first to indicate disorder. The functions of digestion, assimilation, and nutrition often furnish the earliest indications of disease to the casual or superficial observer, but the experienced eye, and the informed mind, detect the antecedents of these, and carry the analysis of the morbid phenomena much farther, and until the agencies producing them are fully disclosed. (*See* Scrofula and Tubercles, § 39, *et seq.*)

187. iii. Causes operating during and subsequently to Puberty.—*A.* It is manifest that when the mental *studies* of the upper and middle classes of society, at this period of life, are pursued too far, or to the neglect of those amusements and exercises requisite to health, and to the proper development of the frame, pulmonary consumption will follow in a large proportion of cases, especially when the constitution is predisposed by original conformation, by the strumous diathesis, or by other causes acting in earlier life, or concurrently with this. If these studies are rendered still more injurious by stooping positions, or by pressure of the side against a desk, whereby the actions of the respiratory apparatus are hampered or confined within too narrow limits, the injurious effects will be more certain. But, where these latter causes are not present, others equally injurious may operate; and these may either be too close cinctures of the lower regions of the chest, the pressure of unyielding, or insufficiently yielding supports in the stays worn by females; the use of steel supports, which conduct the electricity of the frame from the body into the air, and thereby deprive the nervous system of a salutary stimulus; and insufficient clothing on the neck, upper regions of the chest, and shoulders, or even the complete exposure of these parts without any clothing whatever, are not without their influence, either as exciting or concurrent causes, especially where a predisposition to this disease already exists. (See also *art.* Scrofula and Tubercles, § 57, *et seq.*)*

188. *B. Trades, employments, and conditions of life* are conducive to pulmonary consumption when they prevent exercise in the open air; when they are followed in cold, low, close, humid, and dark apartments or situations, or in confined, bent, or cramped positions of the body, as by miners, &c. As to the comparative liability of persons pursuing different trades and occupations, no precise information has been furnished, as the number of persons occupied in each of these trades, in connexion with the number attacked with phthisis, can rarely be obtained. It is manifest, however, from the researches of Drs. Guy and Lombard, that the deaths from this disease in those who follow in-door occupations are about double the deaths of those who pursue out-door employments. Shoemakers, tailors, milliners and dressmakers and other needlewomen, clerks and shopmen, weavers and glovers, compositors and printers, servants, bakers, &c., are among the trades most liable to phthisis. Beddoes stated that

* [We think that too little importance is attached to the influence of *diet* as a predisposing cause of phthisis. It is a disease characterized by a deficient and depraved nutrition, an impoverished state of the blood, and constitutional debility of the digestive organs, and whether the result of predisposition or otherwise, its foundation is often laid in mal-assimilation of food, or food of an improper kind. This is evident from the fact that the disease may be warded off by measures directed to the invigoration of the digestive organs, such as appropriate diet of nourishing animal food, abounding in hydro-carbonaceous and protein matters, with suitable exercise, and other tonic regimen. Dr. Charles Hooker (*Trans. Am. Med. Asso.*, 1855, p. 478) contends that, in most cases of phthisis and of predisposition to it, among other errors of regimen, four are especially prominent, viz.: 1st. Irregular eating; 2d. A restricted variety of food; 3d. The avoidance of oily nutriment; 4th. An excessive use of drinks; and he urges that if due attention were given simply to the correction of these errors, even with no medication, more could be accomplished in the cure and prevention of phthisis than by the most efficient medication, without attention to dietetic regimen.—*Ed.*]

butchers are less liable to this malady than those following any other employment, and later observations have confirmed the statement. Dr. Trotter made a similar remark in favour of sailors, and this is rendered more obvious by the more liberal diet allotted to them now than formerly. Dr. Withering considered stable-boys, grooms, post-boys, and dragoons less liable to phthisis than other employments, and such appears, upon the whole, to be the case. The occupations in which dust and other irritating particles, whether mineral or vegetable, are inhaled into the lungs are especially productive of diseases of these organs, and particularly of pulmonary consumption, bronchitis, asthma, and various complications of these, either with one another or with other lesions. But this subject, and the several topics connected with it, more especially with relation to the causation of pulmonary diseases, are fully considered under the head Arts and Employments *as Causes of Diseases*.

189. *C. The instinctive emotions and desires* are more important causes of tubercular phthisis than is generally supposed by either medical men or others; and this category of causes are most influential in young persons of a scrofulous diathesis, and in those who are otherwise predisposed, more especially by the causes already mentioned. —*a*. Premature or excessive sexual desires and indulgences, and still more the crime of self-pollution, are the chief of the class of causes in producing tubercular phthisis, and several other maladies. This crime, for it is no less than a crime, and one most severely, but not unjustly, punished by the Mosaic law when detected, is one more frequently practised by both sexes than may be believed by those who have not had occasion to inquire into the matter; and it is most prevalent in those who are sanctimonious and pharisaically censorious of others. The injurious effects of this crime are probably greater in the male than in the female, especially in causing tubercular phthisis; and it is not improbable that the rite of circumcision among the Jews was instituted partly with the intention of preventing the excitement to the commission of it that is liable to occur in the uncircumcised. Various mechanical contrivances for the prevention of the vice in females were employed from very early ages, and several of these adopted in the middle ages may be seen in museums of antiquities. No more certain means of exciting females to this vice can be supposed than riding. Instances have come directly to my knowledge of females having relinquished horseback exercise entirely on this account.

190. *b. Celibacy* may be viewed as a cause of tubercular phthisis, although the reason of its being a cause may not be obvious to many. It is, however, more generally known that the average duration of the life of bachelors is much under that of married men. This is mainly owing to the circumstance of their having become addicted to the crime of masturbation. A very large proportion of those who are thus addicted are impotent, and many of them are conscious of this fact, and do not marry; while others continue this vice in preference to sexual congress, and often pay the penalty by inducing this or other diseases. Several instances have occurred in my practice of persons having admitted, when afflicted with phthisis, or with any other of the maladies entailed by this vice, that they were conscious of the cause only when too late, and often when their minds and the powers of volition were too much weakened to resist the impulse to its commission. Even married men who had become addicted to it previously to marriage have continued it subsequently, as they have themselves confessed to me in several instances.

191. *D. Mental Exertion and the moral Emotions.—a.* Mental exertion, especially when prolonged or intense, is more frequently a concurring than an exciting cause, unless where an original or acquired predisposition to phthisis already exists. It is injurious chiefly about or soon after the period of puberty, when the frame, in all its parts, is not fully developed and consolidated, and when exercise in the open air, and in light and sunshine, which it often prevents, and which is requisite to perfect bodily organization, is neglected. This cause is often also heightened by the position of the body, especially by the stooping position, which during mental application is often too long retained.

192. *b.* The depressing emotions and affections, anxiety, longings after the objects of affection, either absent or lost, disappointments, losses of fortune or friends, &c., severely depress the organic or vital influence, impair digestion and assimilation, and predispose to, if they do not actually occasion, this malady.—*c.* Under this category may also be placed nostalgia in its various longings for early abodes, scenes, and objects, and for the society of early or beloved friends. (See also *arts.* Disease, *the Causation of*, § 22, *et seq.*, and Scrofula and Tubercles, § 61, 62.)

193. iv. Contingent and associated Influences or Circumstances aiding or concurring in occasioning Phthisis.—*A. Sex.*—According to the Registrar-General's returns, the deaths during two years and a half (1837, '8, and '9), in England and Wales, from phthisis were 146,338, being 69,009 males, and 77,329 females; and in 1847 the deaths from this disease were 25,083 males, and 28,234 females. Mr. Ancell says, that "from the Irish reports, it appears that of 135,590 deaths from phthisis, 63,635 were males, and 71,955 females. In London, however, and in the large manufacturing towns, the proportion of deaths from phthisis in males and females was different. In London, from 1843 to 1846, the deaths were greater in males than in females, by nearly six per cent. According to the returns for 1847, the deaths from scrofula, tabes mesenterica, and hydrocephalus were 8105 in males, and 6542 in females; and from phthisis 25,083 males, and 28,234 females; thereby showing that, while the former scrofulous diseases were more fatal in males than in females, the latter, or phthisis, was more fatal in females by nearly six per cent (5·9). In this country, therefore, it appears that females are slightly more liable to consumption than males. In the metropolitan district, however, the deaths in 1838 from phthisis were 4057 males, and 3630 females; and in 1839, 3749 males, and 3355 females. The deaths in this district, in 1838, from phthisis were 7687, while in the southern counties, the population of which is somewhat greater, they were 5805.*

* [In the city of Baltimore, for the year 1850, the mortality among the blacks from phthisis was 50 per cent. greater than among the whites—the males being 43·5 per cent., to 56·5 per cent. for the females. If we compare the sexes at different ages, we find that up to 15 years the per centage is the same for both; from 15 to 45, it is 38 per cent. for the males, and 62 per cent. for the females. After this age the males slightly predominate.

194. *B. Age.*—The several tubercular maladies present a greater or less frequency of occurrence at one epoch of life than at another. Tubercular meningitis and hydrocephalus are most frequent during infancy; mesenteric decline in early childhood, or about the period of weaning; external scrofula, from the period of weaning till puberty; and phthisis from puberty until advanced age. The following abstract from the returns for 1845 and 1846 will show the deaths from phthisis, *in London*, at successive epochs of life:

Years of Age.	Mortality from Phthisis at successive Epochs.			
	Males.		Females.	
	In 1845.	In 1846.	In 1845.	In 1846.
Under 5 years.	354	234	316	269
5–10	88	88	114	92
10–15	59	61	107	104
15–20	191	219	214	228
20–25	343	387	349	362
25–30	405	450	426	434
30–35	436	456	379	383
35–40	431	454	328	401
40–45	379	397	279	305
45–50	312	346	218	211
50–55	240	234	133	135
55–60	155	179	97	99
60–65	111	104	72	60
65–70	73	66	46	48
70–75	21	36	15	15
75–80	9	14	9	6
80–85	4	1	1	3

195. In 1845 the deaths from phthisis *in London*, at all ages, were 3624 males, and 3107 females; and from all causes, at all ages, 24,496 males, and 23,836 females; the deaths from phthisis being in both sexes 6731, and from all causes 48,332. In 1846 the deaths at all ages from phthisis were 3729 males, and 3161 females; and the deaths from all causes, at all ages, were 24,941 males, and 24,148 females; the deaths from phthisis, in both sexes, being 6890, and from all causes 49,089. From these returns it appears that the proportion of deaths from phthisis among persons advanced in age, the number of persons thus advanced being considered, continues great to very mature age.

196. The following table is an abstract from a more extended one by MR. ANCELL, which he had made from the Registrar-General's returns for 1847, in which the deaths by phthisis, in all *England and Wales* at the several epochs of life, are stated and compared with the mortality by all causes, and with the number of persons living of the specified age in the middle of that year.*

197. *C. Diathesis and temperament* predispose more or less to phthisis, but it is difficult to determine the extent to which they have this effect. It is even more probable, and more agreeable with experience, that original or early-acquired conformation of the body, arising from causes affecting the parents, has more influence in predisposing to phthisis than the temperaments, as they have hitherto been described by physiologists, or

Years of Age.	Mortality from Phthisis.			Mortality from all Causes.			Estim'd Population of that Age in 1847.		
	Males.	Females.	Both Sexes.	Males.	Females.	Both Sexes.	Males.	Females.	Both Sexes.
Under 1	1,251	1,164	2,415	49,547	39,237	88,784	215,150	234,959	450,109
1 to 2	676	656	1,332	16,666	16,019	32,685	230,463	230,038	460,501
2– 3	318	345	663	8,900	8,513	17,413	233,383	235,187	468,570
3– 4	212	212	424	5,870	5,803	11,673	217,806	221,556	439,362
4– 5	179	182	361	4,123	4,137	8,260	215,225	215,026	430,251
5–10	780	876	1,656	9,768	9,369	19,137	1,020,042	1,022,576	2,042,618
10–15	910	1,432	2,342	5,101	5,330	10,431	942,534	915,115	1,857,649
15–20	2,294	3,232	5,526	6,615	7,126	13,741	836,845	865,094	1,701,939
20–25	3,521	3,899	7,420	8,241	8,324	16,565	774,542	888,360	1,662,902
25–30	2,983	3,683	6,666	7,216	8,190	15,406	657,138	722,120	1,379,258
30–35	2,373	3,094	5,467	6,626	7,623	14,249	604,706	646,972	1,251,678
35–40	2,212	2,545	4,757	6,833	7,387	14,220	465,847	482,871	948,718
40–45	1,847	1,903	3,750	6,909	6,917	13,826	466,338	486,047	952,385
45–50	1,534	1,404	2,938	7,135	6,462	13,597	345,472	349,380	694,852
50–55	1,261	1,111	2,372	6,981	6,684	13,665	328,848	351,469	680,317
55–60	1,025	874	1,899	7,615	6,982	14,597	202,956	217,199	420,155
60–65	749	715	1,464	8,703	8,725	17,428	223,801	247,912	471,713
65–70	515	505	1,020	9,220	9,323	18,543	129,211	149,231	278,542
70–75	253	246	499	9,935	10,782	20,717	111,365	129,120	240,485
75–80	128	109	237	9,357	10,552	19,909	59,546	69,089	128,635
80–85	41	26	67	6,651	7,799	14,450	33,295	42,745	76,040
85–90	9	10	19	3,487	4,380	7,867	10,770	14,881	25,651
90–95	2	3	5	1,006	1,571	2,577	2,662	4,333	6,995
95 et sup.	....	....	....	302	538	840	622	1,175	1,797
All ages..	25,083	28,340	67,964	113,076	207,901	420,977	8,368,914	8,755,174	17,124,088

The deaths from 15 to 20 were 7·2 per cent.; from 20 to 30, 31·2 per cent.; from 30 to 40, 25 per cent.; from 40 to 50, 12·6 per cent.; from 50 to 60, 10 per cent.; over 60, 62 per cent.; from 1 to 15, 6 per cent. The mortality from consumption, as compared to the whole deaths, excluding still-born, in the following cities, is as follows:

Baltimore,	average from 1850 to 1854 is	1 in 6·2
Philadelphia,	1854	1 in 8·0
New York,	1852 to 1854	1 in 7·5
Boston,	1848 to 1852	1 in 6·6
London,	1853 & 1854	1 in 9·2

CHARLES FRICK, *American Journal of Medical Science*, Oct. 1855, p. 330.]

* [It is to be regretted that we have no data by which we may judge with any accuracy in regard to the prevalence of tuberculosis in the different sections of the United States. It is a common belief that the disease is more rife on the Atlantic coast, especially of New England, than in the interior, and at a distance from the sea-board. The mortuary statistics of Massachusetts, however, taken by the state authorities, do not sustain this opinion—the western counties furnishing as large a ratio of deaths from phthisis as the eastern. There is little doubt that, if a correct comparison were made between an equal population in a malarious district of the western country and on the sea-board, where malaria does not exist, the mortality from this disease would be found far less in the former. But between the Northern and Southern States, provided the regions are not malarious, it is probable that very little difference would be

conventionally admitted by medical writers. Temperaments are so mixed with one another, with diathesis, habit of body, and with states of vascular plethora, or its opposite, as to be rarely distinguished with precision, or to be viewed only as states of constitution, which every physician estimates conformably with his own views, although he may not be able to describe them with precision, or agreeably with the conception of others. I have nothing to add at this place to what I have observed above (§ 9, *et seq.*) on this subject, and that is much less satisfactory to myself than I wish.

198. *D. Seasons, weather, and atmospheric conditions and vicissitudes*, have less direct influence in producing phthisis than has generally been supposed. They are, however, frequent concurrent and determining causes, and when they appear most efficient in occasioning this malady, they often act by producing catarrh, bronchitis, or pneumonia, either of which may develop quiescent phthisis into a state of action, or call the latent predisposition into a more manifest form. Cold conjoined with humidity, especially when the already predisposed, or those not accustomed to these atmospheric conditions, are exposed to them, and sudden vicissitudes of cold, warmth, and humidity, or dryness, or rapid alterations of these, are certainly powerful agents, especially in low situations, in developing phthisis. The rapid transference of terrestrial electricity into the atmosphere, during humid states of the air, has an injurious influence on persons predisposed to, or labouring under phthisis. The vicissitudes of temperature to which many expose themselves by passing from a very warm apartment into the cold external air, or from the latter into the former, and by sleeping in a chamber the temperature of which is many degrees below that of the apartments used during the day, are certainly more or less injurious to persons disposed to phthisis. In cold sleeping-chambers, although the body is protected by warm bed-clothes, the lungs are exposed either to a low range of temperature, or to a higher range generated by breathing the same air repeatedly in consequence of the confinement of the air by bed-curtains. No small injury is often also produced by over-exciting or overheating the body, so as to produce copious perspiration, which often chills the surface, and throws the momentum of circulation inwardly, favouring pulmonary congestion, especially when the external surface is not protected by flannel next to the skin. Living in damp or ill-drained houses, removing into recently-built houses before the walls are quite dry, and living in those which are built on a humid or clay soil, without sunk areas around them, or without sufficient space for ventilation, are more frequent causes of disease, and especially of pulmonary consumption, than they are generally supposed to be, especially in persons of a scrofulous diathesis, or otherwise predisposed.

199. The influence of *seasons* on phthisis is but slight, and almost undetermined. Medical statistics give very little information on this topic, and that little is deficient in precision. The returns of the Registrar-General furnish no data respecting it, for the deaths from phthisis during the four quarters present little difference as to numbers; and when the very remarkable differences of duration presented by this disease are considered, it cannot be expected that the deaths can be an index to the seasons in which the malady was occasioned.

200. *E. Climate and Localities.*—*a.* As to the climate of different countries, and as to the influence of situation and locality, either in favouring or in preventing the prevalence of phthisis, our knowledge is altogether imperfect. Much that has been asserted on this subject is more or less inaccurate, the inaccuracy being often in proportion to the dogmatism with which the matter is treated. That some climates and localities present a much greater prevalence of this disease among their inhabitants than others is an admitted fact; but the degree of prevalence, or the amount of influence attributable to climate only, and the shares which may be imputed to situation, circumstances, habits, customs, &c., of the inhabitants, especially the natives, are either very imperfectly known, or not known at all; even at the best an approximation to the truth only is to be expected. Several writers have stated that pulmonary diseases, and more especially consumption, are rare within the tropics, and in the natives of these countries particularly; but Dr. Webb states that the "records of cases of natives of every part of *India* show that phthisis and pulmonic affections are at least not uncommon diseases among natives of India, and only yield in frequency to fever, cholera, and dysentery, presenting every form and variety that is to be met with in any other part of the world." Dr. Green states that pulmonary consumption is a prevalent disease in the lower provinces of Bengal; and Dr. Webb, who quotes this statement, remarks that he has himself "observed the disease extensively among the Hindoo race, and the Puharrees

found in this respect; and so, on the whole, little if any advantage is gained by a change of climate. The Federal census of 1850 purports to furnish the mortality in one year in every state in the Union, as well as the diseases, age, nativity, &c.; but so little care was observed in taking the returns, that they are of little if any value to the statistician. If they are to be believed, then Mississippi is a healthier state than Rhode Island, and Alabama twice as healthy as Massachusetts, and four times as healthy as Texas; while the deaths from consumption in Texas are but half as many as in Louisiana, and only one seventh as many as in Massachusetts, and one fifth as many as in Maine! The following table, compiled from the U. S. Census returns of 1850, may, however, have a certain kind of value, and we therefore give it:

States.	Aggregate Population in 1850.	Total Deaths.	Per Cent.	Total Deaths from Consumption.	Per Cent. of Deaths from Consumption.	Ratio of Deaths from Consumption to whole Population.
Texas.....	212,592	10,057	4·7	112	·05	1,898
Louisiana	536,135	11,956	2·2	641	·11	838
Alabama	771,623	9,091	1·1	362	·04	2,131
Mississippi ...	606,326	8,721	1·4	332	·05	1,826
Arkansas.....	209,897	3,021	1·4	132	·06	1,590
N. Carolina ..	869,039	10,165	1·1	562	·06	1,540
Tennessee....	1,002,817	11,875	1·1	879	·08	1,140
Missouri	682,044	12,292	1·7	648	·09	1,052
Virginia	1,401,661	19,052	1·3	1,616	·11	869
Dis. Columbia	51,687	846	1·6	135	·25	382
Maryland	583,039	9,621	1·6	1,101	·18	529
Ohio.....	1,890,329	28,957	1·5	2,558	·14	739
New York....	2,581,847	33,717	1·3	5,372	·20	480
N. York City.	515,547	11,838	2·2	1,319	·24	390
Massachusetts	994,514	19,404	1·9	3,426	·34	290
Maine	583,169	7,584	1·3	1,702	·29	362

According to the above table, one in 1898 die in Texas of phthisis, one in 2131 in Alabama, and one in 290 in Massachusetts! So that, as we go north from Alabama, we have the following per centage: ·05, ·06, ·08, ·11, ·14, ·18, ·25, ·34. This statement is sufficient to show the value of the U. S. Census mortuary returns.—*Ed.*]

inhabiting the lower belt of the Himalaya range of mountains." The same writer refers to Dr. Godeve's report of the prevalence of pulmonary disease in *Upper India*; wherein he states, "tubercular phthisis we have had abundance of, as the detailed autopsies forwarded every month show."—Webb's *Pathologia Indica*, p. 100, *et seq.*

201. *b.* Dr. Archibald Smith, in some valuable communications he kindly sent me respecting the diseases of *Peru*, remarks, that "In the negro hæmoptysis is less frequent, perhaps, as a symptom of phthisis, than it is of disease of the heart or aneurism of the aorta. Hæmoptysis is also very often observed in the congestive stage of fever in the Peruvian negro; but with the fever the sanguineous sputa disappear. Comparatively speaking, phthisis is decidedly less common in the negro than in the cross between the negro and Peruvian Indian, or pure Indian bred in the mountains, but migrated to the coast. The mixed races with preponderating Spanish type or blood, constituting the creole white race, nurtured in luxury, idleness, and pleasure, and consequently with an unhealthy physical and moral training, are delicate and feeble of organization; and therefore, of all the different races, the most prone to ailments and failing health, and also most subject to tubercular consumption. In the *purely* white race phthisis is comparatively rare, except among such youths as are sent from Europe with pulmonary complaints. But, as these are found in mercantile establishments, they are usually sent from one station to another, without trying the benefit of mountain air; for in the mountains there are few European mercantile establishments. In 1792 Lima contained 52,000 inhabitants, of whom 20,000 were whites, 23,000 of the negro race, 6000 of the cross of white and Indian, and 3000 only of the pure Indian. At that period the races were treated in their respective hospitals. The whole deaths by hospital and parochial returns were 2795 for the year given. From the *white* hospitals 650 dead were buried, while 692 died in the negro and Indian hospitals; thus showing a much greater mortality among the whites in general (including the creoles). Now, rest assured that phthisis always maintained its relative position among the causes of death next to fevers and dysentery. In the Indians on the coast the relative mortality is far beyond that of the negro. In Lima phthisis and intermittent fevers are less common in the negro than in the white and Indian races. But diseases of the liver, of the heart and aorta, and of the gastric and intestinal viscera, especially dysentery, commit more havoc in the negro and other dark members of this family than among the other races."

202. In other parts of *South America* the occurrence of phthisis appears to be infrequent, especially among the unmixed dark races; but the information respecting these parts and races is very defective. In *Mexico* this disease is said to be rare; as respects the city of Mexico, this may be owing to its high position above the level of the sea, and to other circumstances; but no information is furnished as to the comparative immunity of different races in this country. According to Dr. Hancock, phthisis is almost unknown on the coast of *British Guiana*, and very rare in the mountains. This immunity must have reference chiefly to the native races, as instances of death from phthisis have occurred among both whites and blacks who have removed to that country. Col. Tulloch states that in St. Helena the mortality of the population from diseases of the lungs is about 3·2 per 1000 annually.

203. *c.* Upon reference to my notes respecting the diseases of those parts of the *west coast of Africa* which I visited and resided in for short periods many years ago, and which were inhabited almost entirely by true negro tribes, individuals of the white, Arab, or Moorish races being very few, I find it stated that phthisis, remittent and intermittent fevers, appeared very rarely to occur among the former; but when they migrated to somewhat colder climates, even to the West Indies, phthisis was sometimes observed among them; and this became the most fatal malady to them, excepting small-pox, when they were sent to temperate or cold climates. Although dysentery and chronic diarrhœa were among the most prevalent and fatal maladies among negroes in those parts of Africa, yet the liver appeared less frequently diseased than the spleen in this race; and much less so than in the purely white and mixed races. Among negro children, however, I remarked that mesenteric disease was not uncommon.

204. *F. Race.*—After considering the distribution of heat over the globe as displayed by the isothermal lines of Humboldt (see *art.* Climates), and by the later researches and illustrations of Professor Dove, I infer that less is owing to temperature than to *race* and modes of life in the causation of phthisis. There are numerous circumstances which concur with temperature in producing a climate either favourable or unfavourable to the prevalence of phthisis; and of these coldness and humidity of the air, low elevations from the surface of the ocean, and sudden and frequent vicissitudes of temperature and weather, are among the most influential elements of a climate which favours the production of this malady; while a moderately warm and dry atmosphere, considerable elevation above the sea, especially in warm countries, and regularity of season and temperature and weather, greatly diminish the prevalence of the disease, and favour recovery in the early stage of the malady. But these conditions, favourable and unfavourable, are so associated with numerous other agencies, especially with the influences of race, of social and domestic conditions, of food, habits, and modes of living, &c., that it is impossible to determine the amount of influence which may be ascribed to each.

205. There can be no doubt, however, that the disposition to phthisis existing in different *races or varieties of our species* should be viewed in very intimate connexion with the climates in which they reside, and with the food and modes of living adopted by them. Having ascertained the frequency of the disease in the aborigines of a country or climate, it is next of importance to know how far that frequency may be modified—diminished or increased—by change to other countries, either colder or warmer, or of higher or lower elevation, &c., and by the adoption of different food and other habits. Our knowledge of these subjects is deficient, and the difficulties in the way of improving it are many; but, before I endeavour to draw a few brief inferences closely connected with it, I shall succinctly notice such information as I have found calculated to remove a few of these difficulties. Several of the most important topics connected with this subject, and more especially in connexion with pulmonary consump-

tion, are discussed in the article Climate, to which I must refer the reader.

206. In countries in which the isothermal lines of annual temperature range from 70° to 85°, phthisis appears to be rare among the aborigines; but it is more or less increased in frequency in mixed races, and in those who have migrated from very warm to cooler districts, or from a dry and elevated situation to low and humid localities; but the amount of increase under these circumstances cannot be shown. In *Upper Egypt* and other parts of *Northern Africa*, and those places in *Western Asia* where the annual range of temperature is not much above 75°, or below 65°, phthisis is very infrequent, although numerous circumstances combine to occasion external tuberculosis, especially in children, and probably also mesenteric disease; and of these circumstances the most influential are evidently insufficient and unwholesome food, and want of cleanliness. The immunity of these countries, more particularly of Egypt, from phthisis, was well known to the ancients from the days of Aristotle; and hence this country was recommended by them as a place of residence for consumptive patients. It is stated by Chardin, Fryer, Kaye, Kerns, and others, that consumption is seldom observed in *Syria* and *Persia*; and MM. Broussais, Boudet, and other French writers, remark that phthisis is rare in the natives of *Algiers* and of the *Barbary Coast*, the mean annual temperature varying from 68° to 72°. The former of these writers observe, that in Algiers, where periodic fevers prevail, of 40,000 cases in the French army only 62 were consumptive; and that the deaths from this disease were 1 in 102, while in the army in France they were 1 in 5. In the *West India Islands* the annual mean temperature varies from 75° to 80°. The statements respecting the prevalence of phthisis in these islands vary remarkably, and are often contradictory; but, upon the whole, it appears that this disease is not infrequent among the dark races, especially negroes who have been brought from Africa, and among creoles. Drs. Musgrave, Davy, and Hunter say that it is rare among the indigenous inhabitants. The reports of Col. Tulloch give five deaths from disease of the lungs annually in 1000 of the population in Jamaica; and a greater mortality from phthisis among white troops stationed in these islands than in their own country, but a much less mortality when stationed in the East Indies.

207. The *East Indies* furnish a variety of climates, according to latitude, elevation above the level of the sea, and the other elements constituting climate (see *art.* Climate). The annual isothermal lines vary accordingly from 66° to 82°; and although cases of phthisis among the native races are not rare, especially in the jails and other places, where several causes concur with race and climate in occasioning the disease. According to the accounts furnished by Stewart, Jackson, Balfour, Sykes, and others, it appears that external scrofula and phthisis occur, especially the former, in the several races in the East Indies, but in very different degrees of frequency. The writers on this subject generalize from very limited sources of observation, in respect both of climate and race. It is, however, agreed that tuberculosis, both external and internal, are most prevalent in the half-castes, or cross between the whites and natives. Col. Sykes states that in 267,456 cases of all diseases treated during five years at the dispensaries in *Bengal and North-west Provinces* there were 115 cases of external scrofula and three deaths, and 187 of phthisis and nine deaths; thus showing a low rate of tuberculosis in the natives of India. Dr. Balfour states that phthisis is very rare in the natives serving as troops in the *Madras* Presidency, the deaths annually from this disease being only ·4 or ·3 per 1000. It should not, however, be overlooked that negroes, when removed either to the West or East Indies, are more liable to phthisis than in their native countries.

208. As to the frequency of phthisis in *Madeira* accounts are most contradictory, some writers stating extreme opinions on the subject. Upon the whole, it appears that the disease is not infrequent among the natives, and that it is even common among the lowest class. In *Malta*, in *Italy*, *Spain*, *Portugal*, *Greece*, *European Turkey*, and southern parts of *France*—in all the places to which consumptive patients are so often sent from this country — the disease is more or less prevalent; generally as frequent in all these places as in this country, and in some even more frequent. M. Andral states phthisis to be very prevalent in the Mediterranean Archipelago. Mr. Spencer Wells says that one third of the deaths at the Royal Naval Hospital in Malta were from this malady; Drs. Burgess, Lugol, Andral, Merryon, and others, state that phthisis is most fatal, especially in certain localities, both in *Italy* and *France*; and of these Orleans, Rheims, Montpellier, Marseilles, Nice, Rome, Naples, &c., are not the least remarkable. Mr. Ancell gives the following table of the ratio of deaths from phthisis to all deaths in the civil and military hospitals of these countries:

Leghorn....	Civil and military.....	1 in 10·75
Florence ...	Civil	1 in 11·5
Rome.....		1 in 3·4
Naples	Average of three hosp..	1 in 2·33
	Military.....	1 in 3·85
Paris	Civil	1 in 3·25
	Military.....	1 in 12·2

In Marseilles the deaths from this disease are stated to be one in four, in Naples one in eight, in Nice one in seven; but these can be viewed as approximations only to the truth. There can be no doubt that, even omitting the deaths from other tubercular diseases, those which occur from tubercular consumption among the inmates of children's hospitals or institutions, and those brought up in these institutions, are even greater than any just noticed in either of these cities. Dr. Caspar, of Berlin, gives the following table of deaths from phthisis in different cities in Europe and the United States, the average being about one in six:

Berlin dur.	10 yrs.	1 death fr. phthisis in	5·7	deaths
Paris.....	4 "	1.....	5·5	"
London....	2 "	1.....	6·2	"
Hamburg ..	3 "	1.....	4·6	"
Stuttgardt	.10 "	1.....	4·7	"
New York	.11 "	1.....	5	"
Philadelphia	7 "	1.....	7·7	"
Baltimore..	8 "	1.....	6·7	"
Boston	7 "	1.....	5·9	"

In *Belgium* and *Holland* phthisis is quite as prevalent as in England and France. In *Sweden* the deaths from this disease are said to be about one in nineteen of all deaths. Dr. Gellerstedt remarks that the mortality from this malady in

the military hospitals in Stockholm is eight in 1000, and that the life of a soldier is favourable to the production of phthisis, which he believes to be on the increase in Sweden. According to a writer in the British and Foreign Review, this disease is rare in *Denmark*, and still rarer in *Norway*, *Lapland*, *Iceland*, and the *Feroe Isles*. In *Canada*, notwithstanding the severity of the winters and sudden alterations of temperature, the air being dry, tubercular maladies, and especially phthisis, are comparatively rare. In *Russia* this disease is much less frequent than in the southern countries of Europe, although both Sir A. Crichton and Sir G. Lefevre state that external scrofula is very prevalent, especially in St. Petersburg and Moscow, and remark that those who bear about them scars from scrofula are supposed to be exempt from phthisis.*

[The compiler of the "*Statistical Reports on the Sickness, Mortality, and Invaliding*" among the British troops stationed in every quarter of the globe arrives at the conclusion that *phthisis pulmonalis* is more prevalent in southern than in northern latitudes, and that "*it is by no means likely that any beneficial influence can be exerted by climate itself.*"

Dr. Forry ("*Climate of the United States*," p. 236) remarks, that "the conclusion that pulmonic lesions, as regards the annual ratio, are more prevalent in certain *systems* of climate in southern than northern latitudes, is confirmed by the statistics of the United States Army; but as we proceed in the investigation of this question, in relation to the relative influence of the *seasons*, the general opinions in regard to change of climate in pulmonary affections, maintained since the days of Hippocrates, will be triumphantly established." Dr. Forry's remarks, however, apply more particularly to bronchial affectionsthan to tubercular disease. The former, we know, are in nearly all, if not all, cases, benefited by change to a milder climate, while the progress of tubercular disease is often, especially in its last stages, hastened by it. Dr. Forry remarks, that the "old idea of the air of a marshy country being beneficial in consumption is only partially true, for among Northern troops, stationed at the South through all seasons, consumption of a tubercular nature frequently supervenes upon febrile diseases, more especially in constitutions broken down by intemperance, standing in the relation of those other sequelæ—dropsy, jaundice, and the various chronic lesions of the viscera." The same fact holds, indeed, in the United States as in Europe, viz., that phthisis is more common in the southern than in the northern parts. Thus, while in London 236 out of every 1000 deaths are caused by pulmonary phthisis, in Sweden the ratio is only 63. At St. Petersburg and Stockholm it is much less destructive than throughout Germany, and especially at Berlin, Vienna, and Paris. In the south of Europe, and especially in Italy, where pulmonary invalids resort in such great numbers for the benefit of their health, phthisis is far more common among the natives than in any part of Great Britain or New England. *Cold* does not *per se* prove favourable to the development of phthisis pulmonalis, for it has been satisfactorily ascertained that the maximum of liability to the disease is found among those who suffer the least exposure to climatic variations. Dr. Forry, however, and other writers of authority, recommend a change of climate in this disease as a remedial agent of great efficacy, and especially the peninsula of Florida, as having a temperature not less equable and salubrious in winter than that afforded by the south of Europe.]

209. "In the *Southern Temperate Zone*, between the isothermal lines of 40° and 70°, comprising the southern part of South America, the Cape of Good Hope, with a portion of South Africa, nearly the southern half of Australia, Van Diemen's Land, and New Zealand, all accounts lead to the conclusion that tuberculosis is much less frequent than in countries situate to the north of the northern tropic." This comparative immunity is owing to the remarkably less liability of the native races to the disease, and to the general dryness of the air, notwithstanding the sudden vicissitudes of temperature. Other conditions, either not known or imperfectly appreciated, may also concur to produce this result. In many parts of Australia, however, the quantity of dust so frequently floating in the air, during the hot and dry seasons, in some measure counteracts the other beneficial influences of the climate as respects phthisis.

210. From the statistical information which has been furnished respecting the prevalence of phthisis in different parts of the globe, and which may be consulted in the works referred to hereafter, the influences of race and of the food adopted by races and by the inhabitants of different countries, are not sufficiently considered, or are even altogether overlooked. Although statistics may nevertheless furnish much that is important on this subject, yet there are other circumstances besides these, which have not been taken into the account. Of these not the least important are, the influences of religious institutions and rites; of the states of social intercourse; of modes of living and of warming apartments in cold and temperate countries; the effects of the soil, of vegetation, of water, and of the emanations from them. Of the agency of these, either in favouring or in counteracting the prevalence or frequency of phthisis, our knowledge is very deficient.

211. From the imperfect information furnished by statistics and by other sources of knowledge, and from what I have stated under Climate, I venture the following inferences as comprising most of what is known of the influence of climate, and of its more important effects in causing tubercular consumption.—*a*. Phthisis is more or less prevalent in the northern temperate zone, especially in the countries of Europe and the United States of North America.

[The deaths from tubercular consumption throughout New England vary from one seventh to one fourth of all that die, according to locality and other circumstances. The seeds of the disease would seem to be more extensively planted in the autumn and winter than at any other season. A vastly greater proportion die of the disease between the ages of twenty and thirty than at any other period; and, during this period, the number of females who die of the disease in New England is nearly double that of males. The same holds true between the ages of thirty and forty. In the

* ["It is proved by the bills of mortality," says Sir George Lefevre, "that one fifth of the population dies of consumption in the British Isles, whereas the deaths in northern latitudes are infinitely fewer from that disease."—"*Thermal Comfort*," &c. London, 1844.—*Am. Ed.*]

country towns of Massachusetts, the proportion of the sexes who die of phthisis is as 39·01 males to 60·99 females; in New York it is as 42·08 to 57·92; and in England, except London, it is as 46·13 to 53·87. It would seem that some causes exist in country towns to extend the disease among females, while different causes exist in cities to aggravate the disease in the other sex. It is a mistaken notion that more die of this disease on the sea-board than in the interior. From 1842 to 1848, in the four western counties of Massachusetts, Berkshire, Franklin, Hampshire, and Hampden, out of 11,803 deaths from all causes, 2398 were from consumption, or 1 in 4·92. During the same period, in the eastern counties, Essex, Plymouth, Barnstable, Bristol, Dukes, and Nantucket, out of a total of 22,930 deaths, 5333 were by consumption, or 1 in 4·29. In Boston, from 1830 to 1849, the deaths from phthisis were 1 in 6·99, or 1 in 7. In New York, from 1838 to 1843, there was, on an average, annually 1 death from tubercular phthisis to 194 inhabitants; in Philadelphia, from 1836 to 1845, 1 in 284; and in London, from 1838 to 1842, 1 in 205. In Portsmouth, New Hampshire, from 1801 to 1825, the deaths from this disease were 1 in 5·02; in Providence, Rhode Island, from 1841 to 1845, 1 in 4·58; in New York city, from 1811 to 1845, 1 in 5·03; in Philadelphia, from 1811 to 1845, 1 in 6·81; in Baltimore, from 1821 to 1845, 1 in 5·97; in Charleston, South Carolina, from 1822 to 1845, 1 in 6·58; in England, from 1838 to 1842, 1 in 6·20; in London, from 1840 to 1847, 1 in 6·97; in Paris, from 1816 to 1819, 1 in 5·55; in Geneva, from 1844 to 1845, 1 in 9·91. Statistics prove that this disease is as prevalent in our Southern States and in the West Indies as in New England, and far more fatal than in Canada and the British provinces of North America.]

212. *b.* This prevalence is most remarkable in the Caucasian race, and in the crosses of this race with any other, more especially with the negro and other dark races.

213. *c.* The natives of countries to the northward of the temperate zone are rarely affected with phthisis while they reside in these countries, and continue the habits and modes of life—of clothing, lodging, sleeping, living, and feeding—which are generally adopted by them; but when they are removed to more temperate climes, and adopt the habits and modes of life of these climates, they evince a manifest tendency to phthisis, which is probably heightened by the nostalgia to which they are subject when removed from their native countries and from accustomed pursuits, habits, &c.

214. *d.* The negro and dark races inhabiting intertropical countries, and the dark races peopling the islands within the tropics, and those in the southern temperate zone are rarely subject to tubercular consumption as long as they remain in their native countries and islands, and continue their usual habits and modes of living; but the offspring from a cross with the Caucasian race, especially when they remove to a temperate or cold and humid climate, and still more these native races when they migrate to such a climate, are even more liable to phthisis than the inhabitants of temperate countries.

215. *e.* The immunity of the natives of the countries to the north of the temperate zone from phthisis is mainly attributable to their active vocations in the open air, to the nature of their food, and its adaptation to the temperature and climate, to the general dryness of the air, to the warmness of their clothing, whereby the skin preserves its depurating functions, and to the warmth of their sleeping-places. (*See* CLIMATE, § 24, *et seq.*)

216. *f.* The immunity, or comparative immunity, of the negro and dark races from phthisis, while they reside in their native countries, is chiefly to be attributed to their outdoor modes of living and exercises, to the adaptation of their food to high ranges of temperature, to the influence of miasmatous districts in counteracting the tendency to tubercular consumption, and in no small measure to the increased functions of the skin in these races, these functions being in them more decidedly supplementary of those of the lungs and liver—more actively depurative of the blood than in the white race. (See *art.* CLIMATE, § 22.)

217. *g.* The greater liability of the dark-skinned races to phthisis, when they migrate to a temperate or cold climate, is mainly attributable to the asthenic diathesis of these races, to the depressing influence of cold, especially in cold sleeping apartments, upon the vital condition of their lungs; to the blight which a low range of temperature produces upon the organs of respiration; to the change in their habits, modes of living, food, &c. The proclivity of cross-breeds to this malady is partly owing to the causes just stated, in connexion with their indolence, their debauched habits, their venereal excesses, and indoor occupations, if occupied at all. The dark races and mulattoes, when they migrate to countries whose annual range of temperature is much below that of their native climates, are disposed to congestive or asthenic inflammatory affections of the lungs; in which, owing to the low grades of vital power and vascular action, the morbid exudation is incapable of the usual changes consequent upon sthenically increased vascular action, but instead assumes the tubercular form, or that state which is incapable of organization, and equally incapable of absorption, and which undergoes the alterations characteristic of tubercular matter.

218. *h.* The Mongolian race, especially as typified by the Chinese, does not appear to be more liable to phthisis than the natives of the northern provinces of India, and of the countries in Asia between China and Europe. Of the Chinese, as well as of these latter countries, our knowledge is very imperfect as respects the relative prevalence of disease. But from what I can learn, tubercular phthisis is not a prevalent disease among them, at least as long as they remain in their native climates, and pursue their usual occupations, habits, and modes of living. How far the various races and tribes inhabiting these vast regions may be liable to this malady when they migrate to either colder or warmer countries, is not known; but the results must manifestly depend upon the many circumstances attendant and consequent upon such migration.

219. *i.* The food of man increases the disposition to phthisis in as far as it is not adapted to the constitution and wants of the races in their native countries—to the different races inhabiting cold, temperate, and tropical climates; to each of which it requires to be appropriate in its nature, as shown in the article CLIMATE (§ 26, *et seq.*). This adaptation of food to race and climate extends to the beverages used by the inhabitants of

different countries; the neglect of this principle of hygiene being demonstrated by the destructive effects of ardent spirits in the dark-skinned races, which are so little injurious to the natives of cold countries.

220. *k.* The influence of clothing upon the frequency of phthisis requires, equally with food, a reference to race, and the considerations which apply to the one appear in great measure to apply to the other. In all races the clothing, and in the dark races the inunctions of the skin, in addition to the slight clothing required by the vicissitudes of season and weather, tend to promote the regular discharge of the cutaneous functions; the fair-skinned races of Europe and America being those in which these functions are least active in health, and most liable to interruption.

221. *l.* Religion and religious rites may be viewed by many as exerting no influence on the frequency of phthisis or of any other disease in any climate. I believe, however, that religious rites exert some influence, but the extent of that influence I cannot state; indeed, it would be impossible to ascertain it, especially in Mohammedan countries, and in countries to the eastward and the north of the former. There can be no doubt, however, that the strictness of diet, and the rites of the Jews, notwithstanding several countervailing influences to which they have been exposed during many centuries, have rendered scrofula, phthisis, and gout less frequent among them than among other peoples in their vicinity (§ 178).

222. *m.* In our estimates of the influence of climate on the frequency of phthisis in the white races, a cold moist climate, and low situation, and without being miasmatous, or a variable and humid climate, is the most favourable to the production of this disease; while a dry, temperate, and moderately elevated situation, with a regular procession of the seasons, or a limited range of temperature, is that which is most likely to diminish the frequency or arrest the progress of the malady. Other considerations connected with climate will be entertained when the prevention of phthisis is discussed.

223. *G. Confinement in prisons, barracks, hulks, work-houses, hospitals, and expatriation, &c.*, are severally productive of phthisis, both in the predisposed and in those who have evinced no marked predisposition, but in the former most especially. In prisons, hulks, and work-houses several injurious influences, physical and mental, combine to produce a more or less marked effect. Insufficient ventilation and exercise in the open air, want of light or sunshine, deficiency of external warmth, low grades of temperature, conjoined with humidity, low and moist situations, and insufficient or unwholesome food, generally combined with depression of spirits, longings after liberty, and weariness of prolonged or hopeless confinement, are the frequent causes of phthisis among the inmates of these places. Dr. BALY states that, in a period of eighteen years in the Milbank Penitentiary, nearly half the deaths and half the pardons on medical grounds were due to tubercular disease, the frequency of this disease progressively increasing after a few months' confinement; and the ratio of mortality in this prison being nearly four times more than that of the metropolis, as regards this malady. Dr. BALY has farther shown that a similar increase of phthisis among prisoners occurs in other places of confinement, both on the continent of Europe and in the states of North America. Dr. ALLEN WEBB remarks, on the authority of Dr. GREEN, that in the jail of Midnapore, in Upper India, in 22° 30′ north latitude, and 87° 25′ east longitude, and in the Calcutta prison, phthisis frequently occurs, although in a hot climate, where this disease is but slightly prevalent. In these intertropical prisons the malady often follows attacks of pneumonia, or it assumes the acute and febrile form, or that described as most common in children (§ 92, *et seq.*).

224. Many of the conditions existing in prisons are, to some extent, present also in *barracks* and in *work-houses*. According to the *Army Reports*, the British foot-guards are much more liable to consumption than the general London population; and in most stations, both in temperate and in warm climates, the mortality from phthisis in barracks is much greater than among the officers or the general population of the country. As respects the guards, something may be owing to the height of the men, tall men being more frequently predisposed to this disease than those of middle size; but much more is certainly owing to the congregation of numbers in a limited space, to the irregularities and vices of a barrack life, and to the influence of a vitiated atmosphere. The results are similar, and often more remarkable, in large public or private schools, where a large number sleep in one apartment, and breathe repeatedly the same air.

225. Confinement in *work-houses* and *hospitals* is injurious chiefly by inducing tubercular disease, in some form or other, and especially in that of phthisis. In the hospitals for children this is especially the case, as shown by MM. RILLIET and BARTHEZ. The continued respiration of the air of a hospital or work-house, without removal from the wards or apartments into the open air, is even more injurious than breathing a more impure air than that in these places, when exercise in the pure open air is enjoyed during the day, the continued respiration of even a slightly impure air being more injurious than the respiration, after intervals, of a much more vitiated atmosphere. The impurity of the air in these places is caused by the numbers breathing the same air in a confined space, by the exhalation from the bodies of the inmates, and by the effluvia proceeding from diseases, morbid discharges, &c. Infants of women confined in lying-in hospitals often become generally tuberculous if they remain long in these places, as I have observed on several occasions when consulting physician to one of these institutions.*

* [Dr. BENNETT has truly remarked, that an observation of the circumstances which precede the disease, or its so-called causes, clearly indicates imperfect digestion and assimilation as its true origin. Thus phthisis is essentially a disorder of childhood and youth—that is, of a period of life when nutrition is directed to building up the tissues of the body. Tubercular diseases are not induced by diminishing the proper quantity of food taken by a healthy man; but if this be attempted with children, or young persons, they are a very common result. Thus, scrofula and tubercle do not originate among the *able-bodied* men in armies and fleets, to whatever privations they may be exposed; but the contrary happens in the young of foundling hospitals, factories, and the poor and labouring classes of the community, as tailors, seamstresses, and others who follow sedentary employments. In the higher classes, they result from imperfect and insufficient lactation during infancy, or the irregular diet caused by carelessness or over-indulgence. No doubt they may frequently be observed in persons whose parents or relatives have been similarly affected. From

226. *Expatriation*, either by transportation for crimes or by emigration, unless the climate to which expatriation takes place be dry and temperate, is generally followed by an increase of mortality caused by tubercular consumption. Even removal from the high lands, and from the scenes of early youth, to the low and humid situations in the same latitude, although the temperature be milder, causes an increased disposition to phthisis. This is partly owing to the mental emotions consequent upon the removal so frequent in young persons thus circumstanced, and is greatly increased by the nostalgia produced in these instances (§ 213).

227. *H. Poverty, and the vicissitudes of fortune and of life*, have no mean influence in both predisposing to and exciting tubercular consumption. MM. LOMBARD, D'ESPINÉ, and LEBERT have furnished sufficient evidence that this malady is much more prevalent among the poor than among the middle and highest classes of society. M. LOMBARD states that the combined statistics of phthisis in Vienna, Paris, Hamburg, and Geneva show that the disease is doubly more prevalent among the poor than in the higher classes. Every competent observer must have remarked the occurrence of phthisis after the loss of fortune, honour, and friends, and have seen mental depression, conjoined with poverty, slowly developing this disease in its most irremediable form, in all temperaments and constitutions, and even independently of hereditary or other states of predisposition. (See also § 170, *et seq.*)

[Dr. RUSH remarks (*Med. Inquiries*, vol. i., p. 37), that "pulmonary consumption is unknown among the Indians in North America," and that "it is scarcely known by those citizens of the United States who live in the first stage of civilized life, and who have lately obtained the title of the first settlers," that "it is less common in country places than in cities, and increases in both with intemperance and sedentary modes of life;" that "females, whose habits are more sedentary than those of males, are more liable to it;" while "ship and house carpenters, smiths, and all those artificers whose business requires great exertions of strength in the open air, in all seasons of the year, are less subject to it than men who work under cover, and at occupations which do not require the constant action of their limbs."—*Loc. cit.* Hence he arrives at the conclusion that the chief method of curing consumption is the invigoration of the body by exercise and labour in the open air—a conclusion at which all known facts and experience constantly point. In regard to this disease being unknown, however, among the Indians, we have observed that it is extremely common among the Chippewas about Lake Superior, and also among the other half-civilized tribes on the borders of civilization. Its prevalence, in fact, is in proportion to the adoption of the vices, manners, and habits of the whites.]

228. v. PATHOLOGICAL CAUSES OF PHTHISIS.—Previous disorder or disease more frequently both predispose to and directly occasion tubercular consumption than is commonly supposed; and the effect is produced not merely by calling the tubercular germs into activity where they already exist, but also by causing their formation and progressive development where no evidence either of a tuberculous diathesis or of their existence had been previously detected. If we endeavour to trace the pathological changes as they successively occur, and remark their nature, from those characterizing the previous disorder, to those which interpose between that disorder and those which constitute the incipient stage of phthisis, we shall be especially struck by the influence produced upon the vital and constitutional powers by the disorder, although apparently slight, which has occasioned this malady. Several of these disorders are so insidious, and others of a more important nature are in some cases so mild, as not to excite any apprehension as to the effects they may produce, and thus they are allowed to proceed, or are exasperated by exposure and neglect of proper treatment and regimen, until the changes or states which either indirectly lead to tubercular deposits or directly produce them more or less fully supervene. In other cases severe attacks of disease, either inflammatory or exanthematous, are injudiciously treated or neglected towards and during convalescence, owing to the desire of the patients or their friends to get rid of medical attendance; or are imprudently or prematurely exposed to the various internal and external causes of disease, and especially to those which in such circumstances more particularly depress organic nervous power, disorder digestion and assimilation, and blight the vital functions of the respiratory organs. During convalescence from epidemic and exanthematous maladies, and from inflammatory affections of the respiratory passages and organs, the patient is often left, by his own self-will and ignorance, without those means which are required to restore his exhausted vital energies, to renew the vigour of the organic nervous system, to improve digestion and assimilation, and to promote the healthy metamorphosis of the colourless chyle globules into the red globules of the blood. In many diseases, and especially in exanthematous and other fevers, the waste of the hæmato-globulin is progressive, and at the period of incipient convalescence it is generally greatest, and the blood is then poorest and most deficient in red globules. Now if these states of exhausted organic nervous influence and of impoverished circulating fluids be not improved by judicious treatment and regimen, or by change to a healthy air, &c., and more particularly if they are influenced by injurious exposures or agents, digestion, assimilation, and nutrition are liable to be perverted, and tubercular germs are thereby rapidly developed, or are directly or primarily produced.

229. *A. Previous disease of the respiratory and circulating organs* has no mean influence in predisposing to, or in directly occasioning phthisis. Frequent attacks of catarrh, catarrhal fever, influenza, hooping-cough, bronchitis, broncho-pneumonia, pneumonia, &c., are severally calculated to develop phthisis, particularly in the scrofulous and lymphatic diathesis. In these diseases the evil is not always to be ascribed to the development during their course of the germs of tubercle which had previously existed, but to the primary formation of these germs or deposits during their

facts of this kind it has been supposed that hereditary predisposition, a vitiated atmosphere, changeable temperature, certain occupations, humidity, particular localities, absence of light, &c., predispose to phthisis. Very frequently several of these are found united, so that it is difficult to ascertain the influence of each. When they so operate, however, they invariably produce, in the first place, more or less disorder of the nutritive functions, and are associated with dyspepsia or other signs of mal-assimilation of food.—*Ed.*]

progress and decline, or their periods of decadence, constituting the early stage of convalescence. In this stage excited action has subsided into more or less of exhaustion, vital power is locally or generally impaired, the circulating fluid somewhat wasted as respects its most assimilated elements, and the digestive and assimilating functions considerably weakened. Diseases of the heart, especially valvular diseases, causing either congestion of the lungs or hæmorrhage from the bronchial tubes, have also no mean influence in developing phthisis; for the congestion thus occasioned is not unfrequently productive of an exudation either into the air-cells or into the parenchyma of the lungs, which passes into the tubercular form, or is converted into or becomes the nidus of fully-developed tubercles. Similar results may also follow the exudation of blood from the bronchi, especially if the fluid pass into the air-cells.

230. *B. Exanthematous diseases* are often followed by phthisis; and this latter malady is more likely to originate during the decline of these diseases, or in their early and advanced stages of convalescence, than at an early period. Of all this class of diseases there is none that is more productive of phthisis, or more rapidly develops it where the germs of the malady already exist, or where a predisposition to it is present, than *measles*, and this is more especially remarkable in persons about or above the age of puberty. I have often observed persons who, by diathesis, hereditary predisposition, or other circumstances, were possessed of a consumptive tendency, pass through measles without any marked pulmonary complication, or any pulmonary disorder that could be detected by auscultation or otherwise, and yet, during the progress of advanced convalescence, or soon afterward, indications of incipient phthisis have appeared, especially if any exposure or want of care had favoured the development of the malady. In this, and in others of the exanthemata, the decadence of the disease, and the consequent convalescence present, as just stated, the most favourable occasions for the origination of phthisis, and these should be carefully guarded against.

231. Of all the exanthemata, there is none so unfrequently followed by phthisis as *small-pox*. It would appear that this latter malady either carried off most of those predisposed to phthisis, when small-pox was a more prevalent disease than it is now, or it destroyed the predisposition to phthisis. I have long remarked, and I believe that others have also remarked, the very rare occurrence of phthisis in any one even but slightly marked with small-pox. It is manifestly otherwise with *vaccinia*, for what I have stated with respect to its influence on the frequency of Scrofula (§ 47–49) is equally applicable to phthisis. It does not appear that *scarlet fever* is influential in producing or developing phthisis farther than that the debility consequent upon it, during convalescence, requires a careful protection from exposures and other exciting causes of this latter malady. Scarlet fever is often attended or followed by enlargement and suppuration of the glands of the neck, especially in scrofulous subjects; and in these cases, as well as in other scrofulous cases, when these glands suppurate, the liability to tubercular consumption is thereby greatly diminished.

232. *C. Suppressed or excessive secretion or excretion* is often more or less concerned in occasioning phthisis. The suppression of an accustomed evacuation or discharge, or the drying up of an issue, seton, or ulcer, or the healing of a fistulous ulcer, as *fistula in ano*, has been followed by phthisis; but in all such cases as have fallen within my observation the disease had commenced previously, or had even made some progress, the suppression of the discharge, especially of hæmorrhoids, or the catamenia, or of the cutaneous excretions, having been followed by a more acute form of the disease, or having developed a chronic, or slow and insidious state of phthisis, into the congestive, inflammatory, acute, or hæmorrhagic, according to the diathesis or habit of body of the patient.

233. On the other hand, excessive discharges, whether hæmorrhagic, secretory, or excretory, may so weaken the constitutional powers—may so depress organic nervous energy, and impoverish the blood, by wasting its hæmato-globulin, as to be followed by tubercular phthisis, either where a predisposition to it already existed, or where causes tending to blight the vital condition of the lungs were in operation—as cold, humidity, &c.; excessive losses of blood, by operation or from hæmorrhoids, from menorrhagia, flooding, &c.; prolonged or improper suckling, diarrhœa or dysentery, enteric fevers, masturbation, and venereal excesses, have severally not unfrequently either caused or developed phthisis, especially where a predisposition to it was present.

234. *D. Impaired organic nervous or vital power*, or debility, whether hereditary, original, or acquired during childhood, youth, or maturer age, is more intimately connected with the occurrence of phthisis than is generally supposed, and is directly concerned with the causation of the impaired conditions of digestion, assimilation, and nutrition, which constitute a large portion of that circle of morbid actions characterizing the commencement and early stage of tubercular consumption. (*See* Debility.)

235. *E. Morbid states of the circulating fluids*, both the chyle and blood, that are so often present at an early stage of phthisis, or even before this state has manifested itself, are the first results of impairment of the organic nervous power; and although comparatively rarely declared in the form of anæmia or chlorosis, yet they consist of a greater or less deficiency of the hæmato-globulin, and especially of the red globules, with an excess of the colourless globules, and a weakened crasis or diminished vital cohesion of the fibrin, and consequently of the coagulum.*

* [It is now admitted by the best pathologists that tubercle is an exudation of protein material in a solid form and of a low grade of development, its shape depending chiefly on the tissue in or upon which it is deposited. It is the opinion of Rokitansky that an especial immunity against tubercle is afforded by an abnormally venous condition of the blood, from whatever cause this may originate; and also by congenital malformations of the heart or great blood-vessels; morbid alterations of the same; deformities of the chest, producing contraction of its cavity; annihilation of the function of one lung by pleuritic effusion; abdominal growths, preventing the free descent of the diaphragm; chronic pulmonary catarrh; emphysema and bronchial dilatation; in short, by whatever prevents due oxygenation of the blood. Pregnancy, also, delays the advance of tuberculous disease, by impeding the respiratory function, thus inducing a venous condition of the blood; and aneurismal and tuberculous diseases do not coexist, because the deposits on the inner surface of the sac exhaust the fibrinous constituent of the blood. Typhus and the exanthemata do not often, if ever, attack the tuberculous, although they may lay the foundation of phthisis. Persons labouring under intermittents, goitre, or rachitis, are seldom liable to tubercular disease; and the same

236. VIII. Of the Operation of the Causes of Phthisis.—*Phthisis*, whether hereditary, congenital and proceeding from causes affecting the parent, or produced by causes acting during early or mature age, generally arises from a concurrence of causes, one or more of which may be much more effective than the rest; they may act either contemporaneously or successively, or the influence produced by one or two may be reinforced or determined by others acting subsequently.

237. i. The causes, then, either affecting the parents, and the offspring through them, or the individual only during early childhood, or subsequently, in the many modes of combination or succession that most necessarily arise from their numbers, are of such natures as to impair vital power, especially as manifested by the organic nervous system, and by the organs and functions endowed by this system.

238. ii. As this system actuates the vascular system and the blood, and as it influences also the digestive, assimilating, and nutritive functions, the secretions and the excretions, so it necessarily follows that causes which depress or exhaust, or otherwise impair the influence or power of this system—the organic nervous—will co-ordinately affect the states of the assimilating functions, of the blood, and of nutrition.*

239. iii. The following may thus be inferred as the successive or morbid phenomena resulting from the action of the causes of phthisis, whether occurring singly, or in various combination, or in succession: 1st. Depression of the organic nervous or vital power of the frame, or an imperfect development of this power, owing to hereditary or congenital, or to more immediate or direct causes operating in early or advancing epochs of life; 2d. Morbid states of the circulating fluids, especially of the chyle and blood, commencing with the slow or imperfect development of the chyle globules, and followed by a slow or impaired metamorphosis of these and the blood globules, or of the former into the latter—the plasma or *liquor sanguinis*, with its fibrin, being deficient in vital endowment; 3d. A wasting or diminution of the red globules, and an impairment of the crasis or vital endowment of the plasma by excessive secretion and excretion from the lungs, skin, and bowels; 4th. The nutrition and vital cohesion of the tissues—the organization of the frame ultimately suffers.

240. iv. These changes in the organic nervous influence or vital power, in the circulating fluids, and in the nutrition of the structures, produced by the causes of phthisis, may take place contemporaneously and co-ordinately; but they may more reasonably be supposed to advance in succession, however rapidly, impaired organic nervous power accelerating and increasing the other subsequent changes. That this procession of morbid changes actually obtains may be inferred from the modes in which the causes may be presumed to operate; for those causes which primarily and chiefly affect, by depressing or impairing, or imperfectly developing, organic nervous power, as hereditary influence, the depressing emotions of mind, &c., may rationally be presumed to operate consecutively, and to no slight extent also impede and disorder digestion, assimilation, and the healthy metamorphosis of the chyle and blood globules, and ultimately the nutrition and vital cohesion of the tissues. Many other causes which more directly tend to prevent the development of the chyle and blood globules, or to promote their waste or destruction, as insufficient food, increased discharges, &c., depress organic nervous or vital power, while they impair or arrest nutrition. Certain causes, again, exert a still more extended influence; for they act directly and manifestly, both by depressing or exhausting vital power and resistance, and by accelerating or increasing the waste and destruction of the hæmato-globulin; nutrition, and the healthy conditions of both the fluids and the tissues being more or less impaired. The most influential of these last causes are premature or excessive sexual indulgences in either sex, masturbation, excessive secretions and discharges, sedentary occupations in ill-ventilated and over-crowded apartments, impure air of any kind, confined and insufficient exercise, defect of light and sunshine, &c.*

241. IX. Treatment of tubercular Consumption.—i. Historical Sketch of the Treatment recommended by Authors.—It was remarked by Dr. Young, one of the greatest of the many names that adorn the literature and science, not only of our profession, but of our country, in his learned work on "*Consumptive Diseases*," that although we may not obtain from the medical writings of the ancients any great variety of information immediately applicable to practical purposes, we may still feel a sufficient interest in the history of a science which deeply engages our attention, to induce us to enquire how long the

will hold true in regard to cancer. No doubt is now entertained in regard to the identity of tuberculous and scrofulous matter, they both having the same elementary composition, undergo the same changes, are produced in the same way, and produce the same effects on the tissues in which they are deposited.—*Ed.*]

* [Prof. Austin Flint observes on this point as follows: "Tuberculosis has been supposed by some distinguished authors to be often preceded and accompanied at its commencement by notable disorder of the digestive function. *Such has not been the fact in my experience.* I have not observed that dyspeptics are prone to become affected with tuberculous disease; and, conversely, tuberculosis has seemed to me, oftener than otherwise, to originate without being attended by any marked evidence of gastric disorder. So far, then, from dyspepsia contributing any ground for anticipating that the evidence of tubercles will be discovered, I have come to regard it in an opposite light."—*Loc. cit.*—*Ed.*]

* [Dr. Hughes Bennett maintains, with great probability, that the peculiarity of phthisis is, that an excess of *acidity* exists in the alimentary canal, whereby the albuminous constituents of the food are rendered easily soluble, while the alkaline secretions of the saliva and of the pancreatic juice are more than neutralized, and rendered incapable either of transforming the carbonaceous constituents of vegetable food into oil, or of so preparing fatty matters introduced into the system as will render them easily assimilable. Hence an increased amount of albumen enters the blood, as shown by chemical analysis, while fat is largely supplied by the absorption of the adipose tissues of the body, causing the emaciation which characterizes the disease. In the mean while, the lungs become especially liable to local congestions, leading to exudation of an albuminous kind, which is tubercle. This, in its turn, being deficient in the necessary proportion of fatty matter, elementary molecules are not formed so as to constitute nuclei capable of farther development into cells; they remain, therefore, abortive, and constitute tubercle corpuscles. Thus a local disease is added to the constitutional disorder, and that compound affection is induced which we call phthisis pulmonalis—consisting of symptoms attributable partly to the alimentary canal, and partly to the pulmonary organs. We may, therefore, conclude with Dr. B., that, 1. An oily emulsion must be formed to constitute a proper chyle to be converted into blood; 2. That in pulmonary and other forms of tuberculosis, this process is interfered with; 3. That, consequently, a state of the constitution is induced favourable to the deposition of tubercular exudation into various tissues, but especially into the pulmonary organs.—*Ed.*]